August 1983

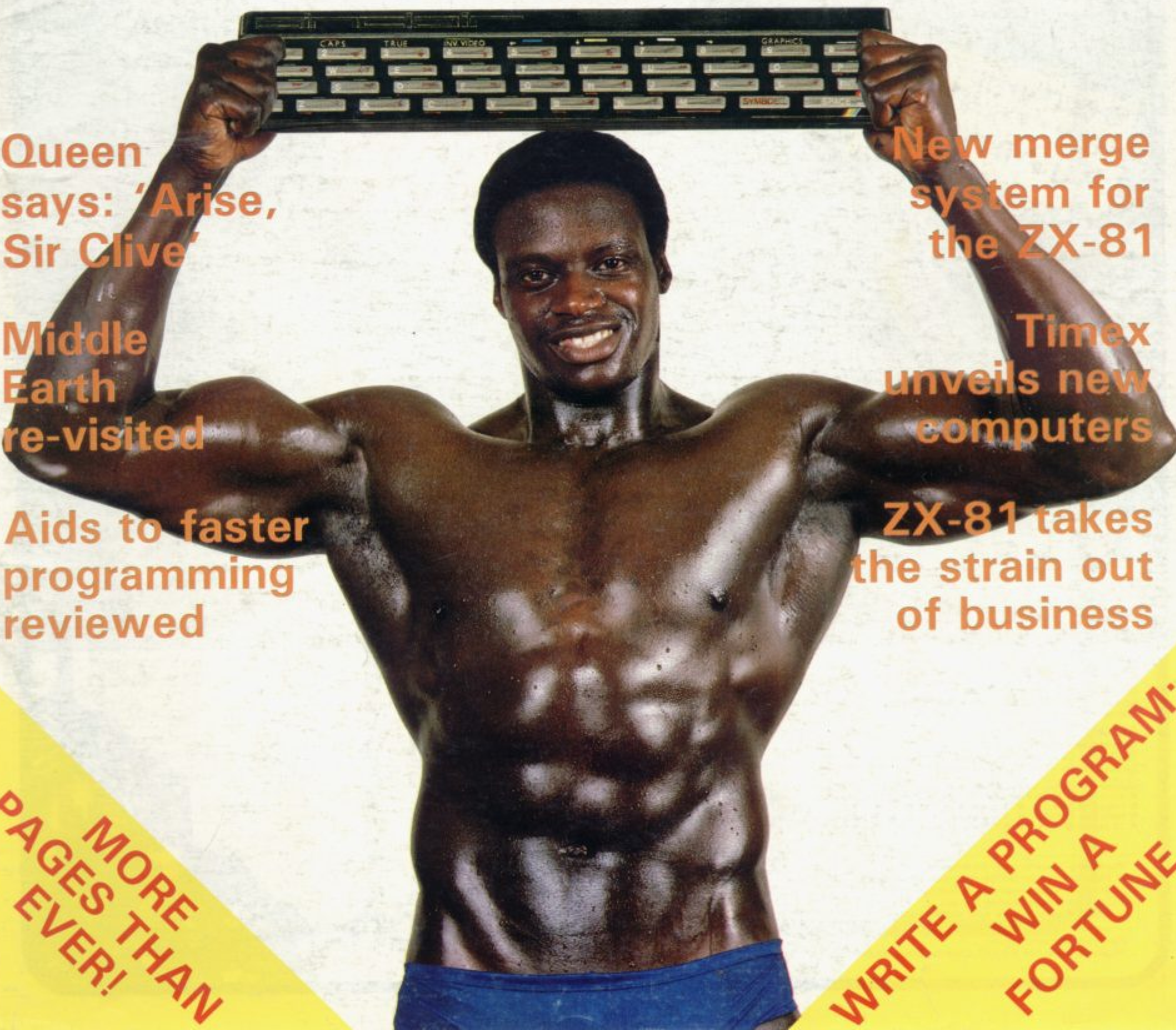
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sinclair user

75p

Issue No 17

STRETCH YOUR SPECTRUM TO ITS LIMITS



Queen says: 'Arise, Sir Clive'

Middle Earth re-visited

Aids to faster programming reviewed

New merge system for the ZX-81

Timex unveils new computers

ZX-81 takes the strain out of business

MORE PAGES THAN EVER!

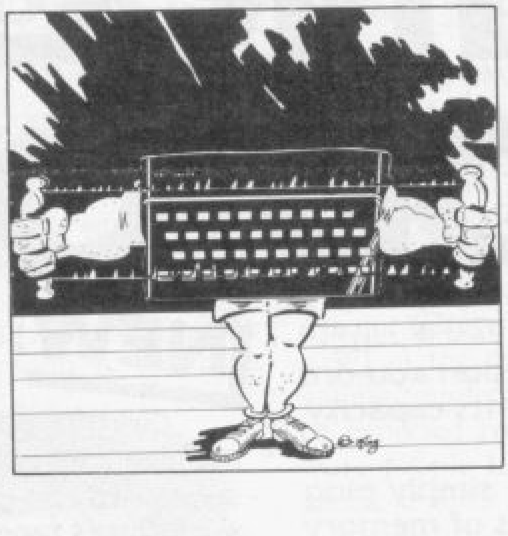
WRITE A PROGRAM: WIN A FORTUNE

sinclair user

incorporating Spectrum User

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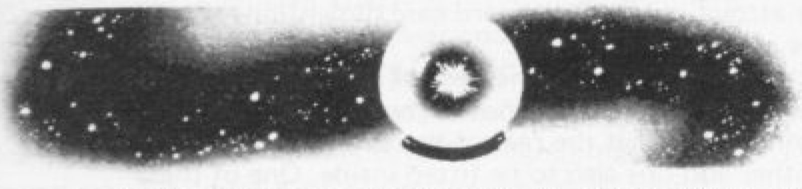


NEXT MONTH
Continuing our series of articles on programming, we give some hints on how to write your own chess program and we speak to Bill Matthews, the man who holds the purse strings at Sinclair Research.

Market loses its innocence

FOR THOSE ROMANTICS who used to find the amateurism of much of the Sinclair market appealing, we have some bad news. There are signs that the dreams of being able to write a brilliant program and then make a fortune from it using the garage as business premises may soon be unfulfilled.

The latest signs of the major change are the entry of the record companies into the market. Virgin and K Tel have



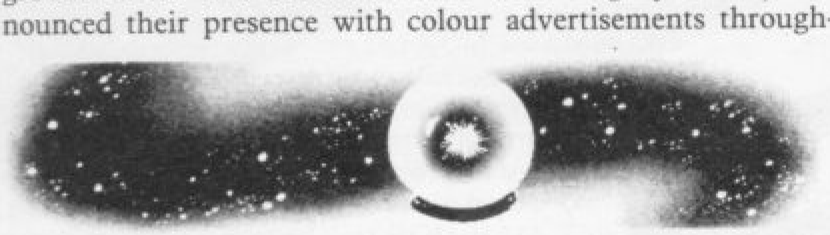
been the first to take the plunge but no doubt others will follow quickly, bringing with them all the razzmatazz and hype associated with the promotion of pop music.

An example of what to expect was the launch of Virgin Games at the Garden Club, the former roof garden at Derry and Toms. Loud music, large crowds, a Maggie Thatcher impersonator and, almost as an afterthought, the games being shown and their writers wandering around looking a little lost.

That may have been the latest sign but the moves away from the old, friendly, low-key activities of the early market when a few people selling games from wooden desks was considered a big event have been happening subtly for the last year.

The changes in the popular ZX Microfairs have shown what has been happening. Originally it was a small group of companies selling their wares on bare trestle tables, with little thought given to presentation. At the recent fair at Alexandra Pavilion in north London, a number of bigger companies like Quicksilva, dK'Tronics and Kempston had specially-designed stands and more companies are thinking of doing the same thing.

At the same time, Imagine made a name for itself by being the first company not to follow the usual method of steady growth. After the founders broke with Bug-Byte, they announced their presence with colour advertisements through-



out the home computer press to establish themselves quickly in a booming market.

It is a move which appears to have been a success, with many of the company's games featured regularly in the Top Ten software sales.

The effect of all the changes has been to raise the threshold of entering the Sinclair market. It is still possible to follow the 'amateur' route of writing a program and to start selling it through small advertisements in *Sinclair User*. That will no doubt continue to prove profitable but for a program to make really big money it will now need a major launch. Without strong financial backing and a supporting catalogue of other software, that would be impossible.

It would be much easier to go to an established company and let it look after the marketing and to pay you a royalty on the sales. Apart from allowing you to enter the market more quickly, it also removes what can be a major headache.

The eventual change of the market into something more similar to that of records has been mentioned previously a number of times in this column. While many people might feel that it is a change for the worse, it is one which must happen if home computing is to fulfil its promise of becoming a major leisure industry in the next few years.

When the market was new and small, people were more willing to tolerate delays and poor quality because that was to be expected from new and inexperienced developments. As more people have become hooked by home computing, the tolerance level has fallen.

If sales are to continue to grow, the need for tips on how to do many of the basic things in the hobby, such as LOADing and SAVEing, must disappear. No-one expects to buy a record



and then find they have to spend half an hour adjusting a music centre before they can play it.

In the same way people should be able to buy a program and have no difficulty LOADing it. The introduction of ROM cartridges is a great help in that, as has already been recognised in the States.

For those who are worried that the ethics of the music industry may be the deathknell of home computing as they know it, it has a number of differences which should ensure that does not happen. For a start, while it is possible to have Top Ten-selling cassettes we are unlikely to have Top of the Cassettes on television and day-long radio programmes promoting the latest releases.

Also, unlike the music industry, it is possible to derive plenty of enjoyment from using a computer without having to buy other people's programs. It can be costly making your own record but for the computer you have to pay only for the cassette and take time to record your program and, after all your work, you may be able to make a fortune.

Arise, Sir Uncle Clive

WE CONGRATULATE Sir Clive on his knighthood, even if it presents some problems to his many supporters. Do they call him Sir Uncle Clive or Uncle Sir Clive? We are sure the difficulty will not last for long.

There can be no doubt that he has done a great job for the British computer industry and has made the sector one of the few bright lights in the general gloom of British manufacturing. That has been achieved on the success of only one good idea, the cheap home computer.

That resulted in a rapid rise to fame and fortune. It also engendered a belief that he can be seen as a saviour of British industry and that only stimulates growing pressure—increased by the news that he has an option on the factory of that former saviour of Northern Ireland, John de Lorean.

The more honours Sir Clive receives, the more the pressure grows and the more difficult it will be to live up to expectations.

ZX 80/81 SPECTRUM HARDWARE

SPECTRUM/81 TOOLKIT BOTH AT ONLY £6.95

This is the toolkit which won acclaim in the feature in the August 1982 issue of Sinclair User. "It is the most impressive programm, fast in execution with clear and full instructions . . . . it stands out from the rest of the field". The ZXED is a powerful editor for use on the expanded ZX81. It is intended for use by the serious BASIC programmer and offers several useful and time saving features most helpful during all stages of program development. The facilities provided are as follows: ALTER, BYTES, COPY, DELETE, FIND, HELP, INSERT, KEEP, MOVE, RENUMBER, AND VERIFY. The Spectrum Toolkit contains most of the features above plus autoline numberer and append, and will run in the 16K and 48K Spectrum.



4K GRAPHICS ROM £24.95

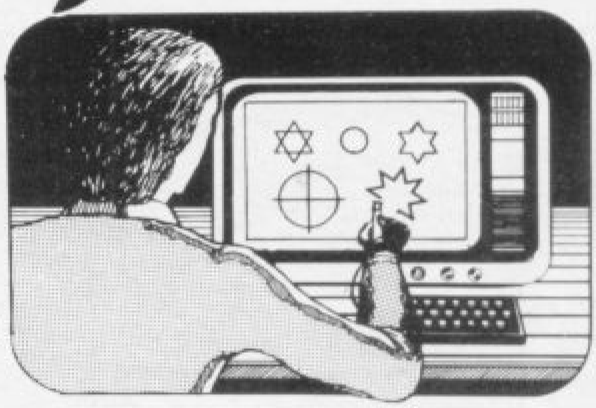
This module unlike most other accessories fits neatly inside your computer under the keyboard. The module come ready built fully tested and complete with a 4K graphic ROM.This will give you an unbelieveable number of extra pre-programmed graphics. This now turns the 81 into a very powerful computer with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders, graphics and that only accounts for about 50 of them, there are still approximately 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

SPECTRA-SOUND

The so called speaker in your Spectrum is really only a 'buzzer'. With the DK Tronics "SPECTRA SOUND" you can generate fully amplified sound through the speaker on your T.V. set. SPECTRA-SOUND is a very simple but highly effective add-on. This means that you no longer have a faint beep but a highly amplified sound, which can be adjusted with the TV volume control.

The SPECTRA SOUND fits compactly and neatly inside the Spectrum case and is connected by three small crocodile clips. **NEW AT ONLY £9.95**

£19.95 Light Pen



LIGHT PEN

The pen enables you to produce high resolution drawings on your own T.V. screen. The controlling software supplied with the light pen has 16 pre-defined instructions. These are chosen from a menu positioned at the bottom of the screen next to the pen.

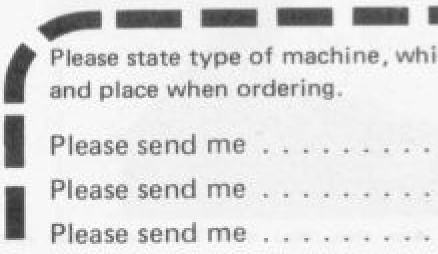
You can utilise the menu for changing colour (Border, Paper, Ink). Drawing circles, arcs, boxes, lines. You are also able to fill any object with any colour, and insert text onto the screen at any chosen place. Of course you can also draw freehand. There is a feature to retain the screens and animate. On the 48K Spectrum you can retain 5 screens.

You can also use the machine code on it's own in your own programs, for selecting out of a menu etc. The software provided will return with the X,Y, cords for it's position on the screen.

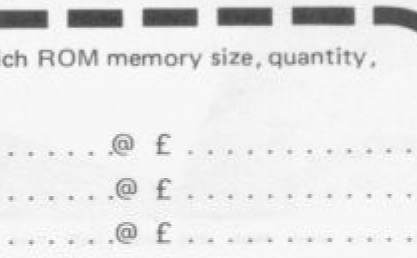
The light pen is supplied with a control interface in order to adjust the sensitivity/pen alignment.

This simply plugs into the ear socket on your spectrum.

Should you require further details please send a S.A.E.



Internal fixing for ZX 81 keyboard case.



Internal fixing for spectrum keyboard case.

Please state type of machine, which ROM memory size, quantity, and place when ordering.

Please send me . . . .@ £ . . . .

Please send me . . . .@ £ . . . .

Please send me . . . .@ £ . . . .

Please add on £1.25 for p/p

I enclose cheque/P.O. payable to DK Tronics total £. . . . .

or debit by Access/Barclaycard No. . . . .

Signature . . . .

Name . . . .

Address. . . . .

. . . .

Send to DK Tronics, Unit 2, Shire Hill Ind Est, Saffron Walden, Essex CB11 3AQ. Tel: (0799) 26350 (24 hrs) 5 lines.

Hestacrest is giving a discount on account

BOTH SINCLAIR machines are being used for business applications by small companies and individuals who want to keep their finances in order. There are many good programs on the market which take care of small company finances and as a result we are offering some of the best business software for both machines.

There are two types of accounts preparation programs for both machines. The **Sole Trader/Partnership** program deals with the accounts of a company which has up to four partners. The second program deals with a limited company's accounts. For all games enthusiasts we are offering new games from Mikro-Gen and Saturn Developments.

The offers are open only to members, although members enrolling this month can take advantage of the offers by including orders with registration forms. Existing members should send cheques to: **Hestacrest Ltd,** PO Box 19, Leighton Buzzard, Beds LU7 0DG.

Saturn Developments, Dept PK, 37 Heol Durlais, Birchgrove, Swansea, SA7 9LT.

Mikro-Gen, 24 Agar Crescent, Bracknell, Berkshire. RG12 2BK.

	List price	Offer price
Hestacrest Ltd		
SPECTRUM 48K		
Accounts — Limited Company	£25	£20
Accounts — Sole tdr/partnership	£25	£20
Combined price for Limited Company and Sole Trader/Partnership	£35	£28
Sales/purchases	£25	£20
ZX-81 16K		
Accounts — Limited Company	£17.50	£14
Accounts — Sole Trader	£17.50	£14
Combined price for Limited Company and Sole Trader	£25	£20
Sales	£20	£16
Purchases	£20	£16
Combined price for Sales and Purchases	£25	£20
Mikro-Gen		
Mad Martha Spectrum 48K	£6.95	£5.75
Saturn Developments		
Lunar Rescue ZX-81 16K	£4.95	£3.95

Special fee for former National ZX User members

Welcome offer to Nationals

FOLLOWING the ending of the National ZX Users' Club, the Sinclair User Club is now the largest club for users of Sinclair computers. It began less than 10 months ago and now has more than 1,100 members.

We would like to welcome former members of the national club who still wish to take advantage of all the benefits of belonging to a large organisation. As a special offer to them we are willing to offer for a limited period a special membership fee.

For only £11 they can have the benefits of joining the Sinclair User Club and joining the many others who have already seen what we have to offer.

The benefits include special exclusive discounts on most of the leading items of software and hardware. This month's offer can be seen on this page. Examples from recent months include the full range of software from Quicksilva and the Digital tracer from RD Laboratories.

To keep members in touch with what is happening in the club, two pages in *Sinclair User* are devoted to club news and there is a special cassette news-letter which is published every two months.

It includes news of the club, programming hints, programs and the number of the telephone advice service. That service has proved very popular and is available to members at most times for immediate help with any of their problems.

The club now has members throughout the world, including most parts of Europe, many in Africa, and one in Papua New Guinea.

Unfortunately we have to place a time limit on this special offer, the final date being August 31. We shall also need some proof of membership of the National ZX Club. The title page of a recent issue of *Interface,* complete with the date would be sufficient.

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name ....

Address ....

....

....

....

Which computer do you own?

ZX-81 ☐ Spectrum ☐

Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.

Sinclair User Club

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Basildon Microcomputer Club: Roger Sims, Wickford 63032, after 6.30pm. Meetings every other week on Tuesdays from 7.30 to 10pm at Healey Management Services, The Hemmels, Laindon, Essex.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh ZX Users' Club: J Palmer (031 661 3183) or Ken Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80-81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80-81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX-Computer Centre: Keith Archer, 17 Sweeting Street, Liverpool 2.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

National ZX-80 and ZX-81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80-81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield ZX Users' Club: A W Moore, 1 Ketton Avenue, Sheffield S8 8PA, Yorkshire. Annual subscription 10, monthly newsletter and cassette.

Sittingbourne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Stratford-on-Avon ZX Users' Group: Chris Parry, 16 Sackville Close, Stratford-on-Avon, Warwickshire.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworthy, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium: ASBL BDMA Belgium National Sinclair Club; P Glenisson, Rue De l'Epeestraat, 14, 1200 Bruxelles.

Belgium, France and Luxembourg: Club Sinclair, Raymong Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468).
Belgian User Group for Sinclair owners (BUGS); Op de Beeck, Patrick, Drabstraat 144, 2510 Mortsel.
Micro-Europe Club; R Betz, Chemin du Moulin, B1328, Ohain, Belgium. Telephone: CCP 000 0846556-37.

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.
ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.
J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jencyzyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Italy: Sinclair Club, Vie Molimo Veccho so/F, 40026 Imola, Italy.
Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

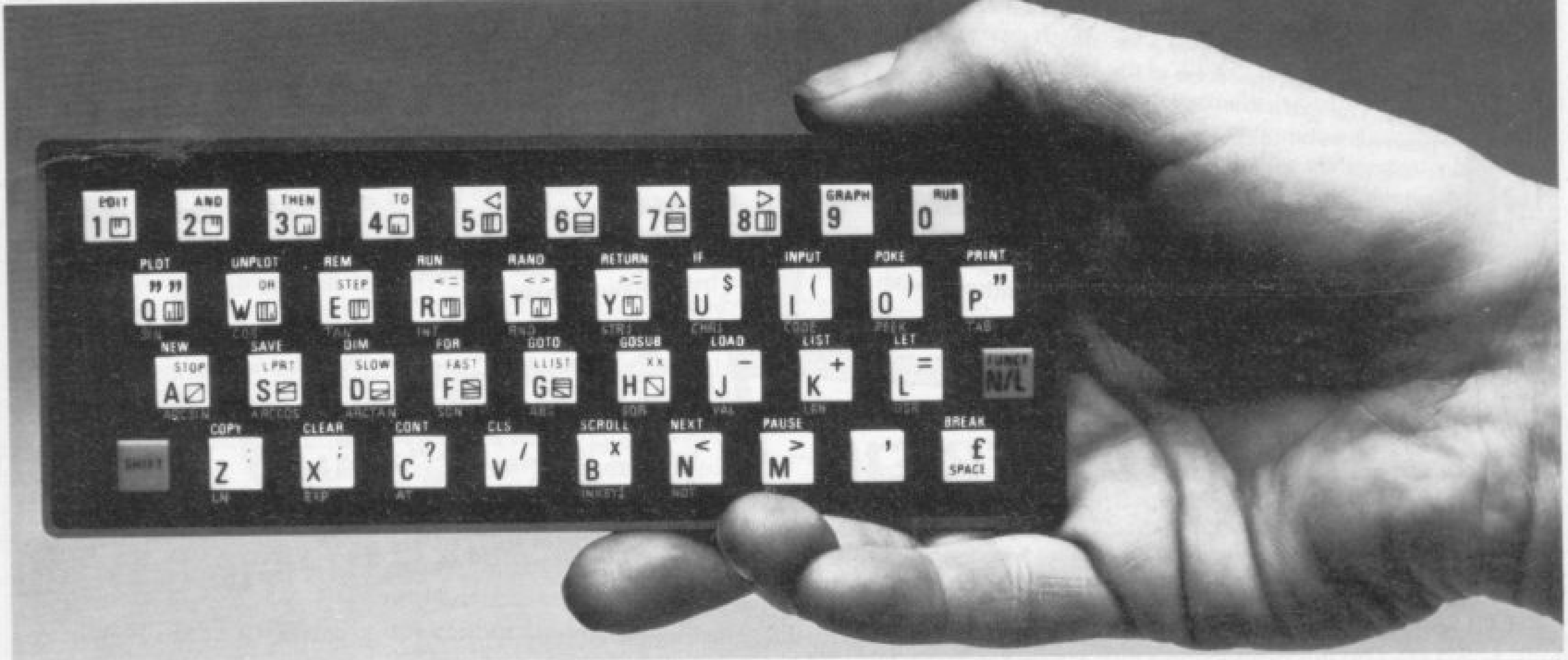
South Africa: Johannesburg ZX-80-81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.
Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.
ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S-122, 22 Enskede, Sweden.

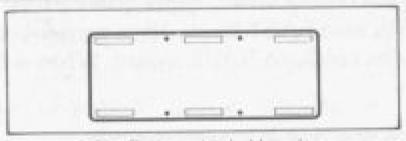
United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).

NOW. A ZX81 PUSH-BUTTON KEYBOARD FOR UNDER £10.

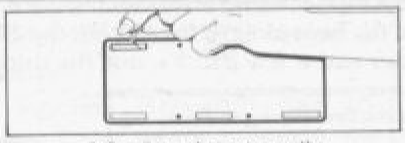




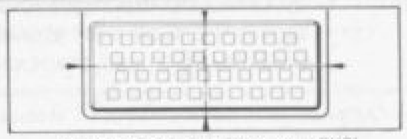
1. Make sure the original keyboard is clean and check that all the keys function.



2. The Buttonset is held in place by self-adhesive pads.



3. So all you do is remove the protective backing.



4. And place it centrally on your ZX81.

At last there's a really cheap but efficient way of ironing out the ZX81's only real bug: its keyboard. The Filesixty Buttonset offers:

■ A full-travel calculator-type moving keyboard for only £9.95. ■ Installed in seconds. The peel-off adhesive backing means you just register into position and press. ■ No messy labels, dismantling or soldering. ■ 3 groups of colour keys to pick out shift, numerals and newline. ■ Precision moulded in ABS to match your ZX81, with contrasting legends for maximum legibility.

Filesixty Ltd., 25 Chippenham Mews, London W9 2AN, England.
Tel: 01-289 3059. Telex: 268 048 EXTLDN G 4087.

Orders to Filesixty Ltd., FREEPOST, London W9 2BR.

Cheques/PO made payable to Filesixty Ltd.

Please send me________ (qty) Buttonset(s) at £9.95 each (including VAT and P&P).

Total £ ________ BLOCK CAPITALS

Name ________

Address ________

SU 9

FILESIXTY

Electric car is now closer

TWO MAJOR STEPS have been taken by Sir Clive Sinclair towards fulfilling his ambition of manufacturing the first mass-produced electric car. He has negotiated an option on the De Lorean car plant at Dunmurry, Ulster and has created a new company, Sinclair Vehicles Project.

Sinclair Research is quick to point out that this is Sir Clive's venture and has nothing to do with it. The new company has taken complete control of the car manufacturing idea.

The team which runs the company says that De Lorean's former factory would be ideal for manufacturing. It is one of the most advanced plants in the country and has the proper assembly-line equipment to produce the electric car. It contains equipment for plastic welding, which would be ideal.

Sir Clive has talked to the Industrial Development Board of Northern Ireland about the use of the facilities at Dunmurry.

Ally is pally

THE EIGHTH ZX Microfair is to be held at Alexandra Palace, London on August 20 from 10am to 6pm. The previous show at that venue in June was the most successful to date. It attracted more than 8,500 people, according to organiser Mike Johnston, compared to the show held last August which attracted almost 7,000 visitors.

Johnston expects an even bigger attendance at the next show and hopes that the Microdrives and RS232 will be on display.

Advance tickets can be obtained from Mike Johnston, ZX Microfair, 71 Park Lane, Tottenham, London, N17 0HG.

Knighthood for Clive

SIR CLIVE SINCLAIR received a knighthood in the Queen's birthday honours. He continues to be a leading figure in the world of computing and microelectronics and his company has sold more than one million computers world-wide.

At present his company is developing a flat-screen television and an electric car.

The names for the honours list are submitted to the Queen by the Prime Minister, who selects outstanding figures in industry and the arts. Margaret Thatcher is known to be an admirer of Sir Clive's enterprising ability. She presented the Japanese Premier with a Spectrum on her tour of Japan last year.

Sir Clive is very happy about the award and says: "The award of a knighthood is a truly great honour and one I value very highly. It was completely unexpected and a wonderful surprise. More than ever I feel committed to achieving success, in and for Britain."



SIR CLIVE SINCLAIR
'Truly great honour'

Telesoftware gets security device

A NEW SECURITY system has been introduced on Micronet 800, the database system to which users of microcomputers can link by telephone.

The system will enable Micronet to select which software can be listed or copied once it has been downloaded on to a user's computer.

It will mean that some programs can be run on a computer, such as the Spectrum, but cannot be SAVEd. Robin Wilkinson, a spokesman for Micronet, says:

"Users will be able to download a game on to a Spectrum by telephone but will not be able to LIST it or COPY it on to tape. It will be like paying 20 pence for an arcade game every time you want to play it. When you switch off the computer the game will be lost."

Several software companies are interested in putting software on to Micronet but will not consider such a move until some form of protection is given.

One such company is Silversoft and Douglas Berne, a spokesman for the company says:

"We would not consider putting software on to Micronet unless we could be given a guarantee that the software would be protected."

Chess prize

INTELLIGENT Software and Sinclair Research are offering a prize of £5,000 to the first person who can write a chess program to beat the Cyrus-IS Chess in a series of games.

Sinclair Research has acquired the game recently for its Spectrum software library. The program is based on Cyrus chess which won the second European Microcomputer Chess Championship.

Its features include cursor movement of pieces, replay and take-back options and the ability to function as a normal two-player game board. A spokesman for Sinclair Research says:

"We have made no plans for matches yet. We are waiting for people to contact us."

National club run ends

THE NATIONAL ZX Users' Club, run by Tim Hartnell, has been disbanded after two years of operation. The reason, according to Liz North, an organiser of the club, was "because of the rising number of computer publications on the market." Another reason was that the club was providing difficulties for the organisers because of its size.

The club used to send a magazine, *Interface,* to its members but because of the number of machine-specific computer publications on the market recently, *Interface* no longer served a useful purpose. North said:

"Interface was the first specialist magazine for Sinclair computers. Now *Sinclair User* and *ZX Computing* have started and our magazine is no longer as useful as it was."

The club had a membership of thousands. The members were informed of the closure by a letter in *Interface* and those who still had outstanding subscriptions were offered books from a range of Interface publications.

• Sinclair User Club offer for former ZX Users' Club members, page 9.

JRS finds a winner

THE JRS AWARD for Programming has gone to David Prigmore of Alverston, Derbyshire. The winning entry was a ZX-81 game called **Star Defence** which JRS Software is marketing.

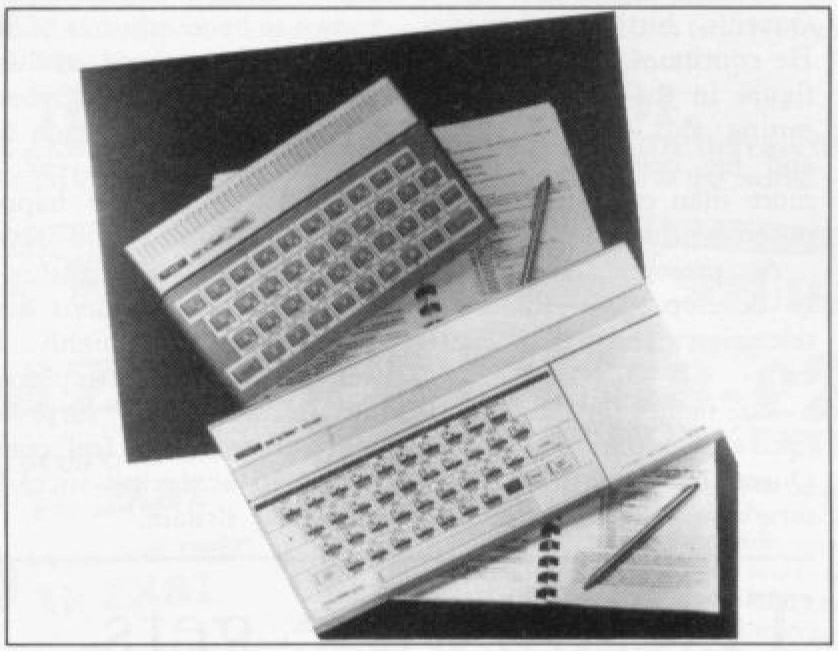
Its author is studying for A levels which include computer science. He hopes to enter the computer industry when he leaves school. John Stubbs of JRS says of the competition: "We were looking for games, utility and business programs. Star Defence was by far the best piece of software submitted."

Home coursing

COMPUTER COURSES with a difference are being held in and around Western-super-mare. The courses are given by Dr Roger Stenner and can be taken at the home of the student or at a centre.

Group or individual tuition is available and fees range from £4 to £7.50 an hour. For more information, 0934 417606.

Timex reveals upgrade plans



TIMEX has revealed its plans for two new microcomputers, the 1500 and 2048, in the States. The specifications of the new computers were shown for the first time at a computer show in Chicago.

The 1500 will be an upgraded version of the TS-1000, the U.S. version of the ZX-81, which has attracted some criticism in the States. The upgrade will have a keyboard which resembles that of the Spectrum.

Unlike the ZX-81, the 1500 will have 16K RAM as standard and an extra 32K RAM module can be fitted to provide 32K. A software cassette, similar to the Horizons tape which is included with Spectrums, will be supplied with each package.

The TS-2048 is the Timex version of the Spectrum. The specifications show the machine to be slightly superior to the Spectrum, although nobody has yet been able to benchtest it.

There are extra commands on the machine according to the specifications. They include FREE, which usually checks memory size; STICK, to control two joysticks; ON ERR, to cope with errors in a program without making it crash; and SOUND, which is like BEEP in every respect except that the volume can be controlled.

The computer is longer than the Spectrum and seems to incorporate a cartridge port into which ROM cartridges can be slotted. No firm release date has been given for the machines but it is hoped that they will appear by the end of the summer.

Spectrum Top Ten

Program	Last Month	Company	Memory
1 Flight Simulation	1	Psion	48K
2 Jet Pack	—	Ultimate	16K
3 Penetrator	3	Melbourne House	48K
4 Transylvanian Twr.	9	Shepard	48K
5 The Hobbit	2	Melbourne House	48K
6 3D Tanx	—	d'Ktronics	16K
7 Ah Diddums	—	Imagine	16K
8 Horace Goes Skiing	5	Psion/Mel House	16K
9 Arcadia	—	Imagine	16K
10 Hungry Horace	7	Psion/Mel House	16K

ZX-81 Top Ten

Programe	Last Month	Company	Memory
1 3D Monster Maze	2	New Generation	16K
2 Flight Simulation	1	Psion	16K
3 Chess	4	Psion	16K
4 QS Scramble	6	Quicksilva	16K
5 Galaxians	3	Artic Computing	16K
6 Space Raiders	7	Psion	16K
7 Alien Dropout	—	Silversoft	16K
8 Avenger	10	Abacus	16K
9 10 Games for 1K	—	J K Greye	1K
10 Catacombs	5	J K Greye	16K

Compiled by W H Smith

Software sold on hard disc

SEVERAL RECORD companies have moved into the software business by including microcomputer programs on their latest record releases.

The move was started by EMI when it produced a single called *Camouflage,* while side B contains the ZX-81 programs. A spokesman for EMI says: "You could say that the state of play at the moment is healthy. We have had a very encouraging response from dealers."

Another computer single has been released by record company Mainframe. It has put programs on side B of the disc. The programs on the record are for the ZX-81, Spectrum, BBC microcomputer and Apple II.

Genetic Records Ltd has put a Spectrum program on to a new album, called *XL1,* by Peter Shelley. The program needed five months to perfect and will work on a 48K Spectrum.

The album was released in June and features 10 musical tracks as well as the program. The graphics displayed on the screen by the computer are synchronised with the music.

One difficulty which has arisen about the use of the records occurs when people try to record the computer tracks on to tape using a stereo system. The reproduction of computer programs using stereo is not good because of phasing problems. It is recommended that only one channel of a stereo is used and the other should be turned down.

EMI says that no complaints have been made about reproduction difficulties, although no information about the use of the computer tracks has been given on record sleeves. The company will, however, be examining the problem closely.

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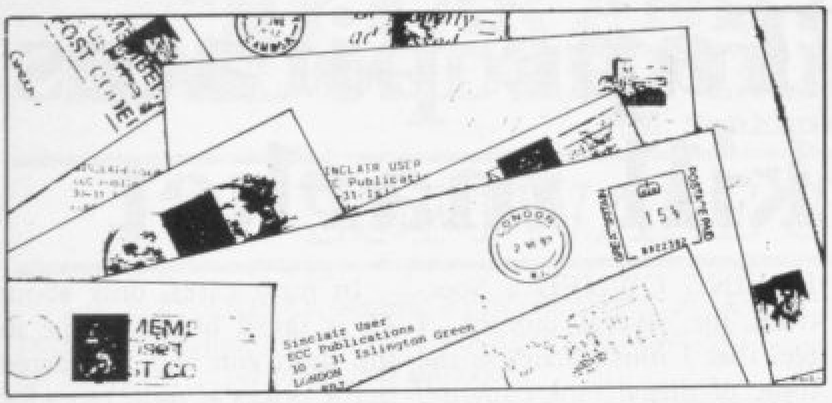
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Picking out variables

THE FOLLOWING tip may be useful. I at any rate had not realised the particular capacity of Sinclair Basic in question until recently. The ZX-81 is able to read a variable name out of a string and then evaluate the variable; and that may enable instructions to be passed to subroutines more compactly.

For example:

```
100 LET A$="DGH"
110 GOSUB AS 900
..............
100 LET A$="XHY"
320 GOSUB AS 900
..............
900 LET T=VAL
   A$(1)**VAL A$(2)+VAL
   A$(3)
910 RETURN
```

This saves several lines, each time the subroutine is called, over the alternative

```
100 LET A=D
110 LET B=G
120 LET C=H
130 GOSUB 900
..............
300 LET A=X
310 LET B=H
320 LET C=Y
330 GOSUB 900
..............
900 LET T=A**B+C
910 RETURN
```

R W Sharples,
London NW7.

The bug search goes on and on

I READ with some interest the letter in the June issue about the bug in Hungry Horace — one which we discovered in January. I thought you may be interested in a bug in the Psion Planetoids which enables one to amass a limitless score without losing any ships.

Shoot all the asteroids except one and then manoeuvre the ship into the top right corner of the screen. With care, it is possible to position the ship so that a small piece appears in each corner. That, coupled with the fact that the ship seems mysteriously to turn yellow in that area, makes one immune to destruction. It is possible to fire from all corners of the screen.

Our high score using the technique stands at slightly more than 224,000. Also the game does strange things when pressing thrust and hyperspace simultaneously; try it. Surely it is possible to test games thoroughly for severe bugs like this?

James Randall,
Surrey.

I WRITE with reference to Ben Beavell's letter in the June issue. I own a 16K Spectrum and have the Hungry Horace cassette. To get out of the third maze, you go straight to the right, waiting for the park-keeper, then go round that section until it is safe to escape to the top. My best score is 1,000,030. It took more than an hour. I also have the Space Raiders cassette and my best score is 10,070.

Nigel Power (15 years),
Oswestry, Shropshire.

Drawing-in more critics

I AM WRITING to give my support to J Johnson, whose letter in the June issue criticised the illustrations which accompany the program listings.

It is easier to assimilate information if it is in a pleasant format, you say, but I am afraid that, like Johnson, I find nothing attractive about this particular format; it simply irritates me as it serves no useful purpose, adds nothing to the program listing, and wastes space which could be put to better use.

Also, I fail to see how a program listing without the comic characters and silly remarks would be impossible to enter. All that is really required is an interesting, well-written program printed with clarity and accuracy.

The present style of presentation may appeal to a minority of readers, perhaps to some of those in the under-16 age group. You should, however, bear in mind the results of the survey in your March issue which showed that only 29 percent of your readers are in that particular age-group, so please have some consideration for the rest of your readers.

Incidentally, why not conduct another survey asking readers what they like and dislike about *Sinclair User?* I think I have already made it clear what I dislike most. As for my favourite part of the magazine, that is undoubtedly the Andrew Hewson column, for which two pages are not sufficient. If all the space saved from the comic bits were given to Hewson, then *Sinclair User* would be worth twice the price.

J A Burgess,
Knutsford, Cheshire.

J JOHNSON'S letter in the June issue concerning the "space-wasting stupid illustrations" is something with which I disagree. I and probably many others think the illustrations are a very good idea, although they could be smaller.

The user-defined graphics program in the same issue is probably a very good program but it wastes a whole page. The illustration takes 50 percent of the page and the program the other half. The page is wasted because everyone who has a Spectrum has the Horizons tape by Psion and on that tape is exactly the same program.

Please make illustrations smaller and think about whether programs are worth inclusion or whether everybody has them.

Philip Stanton,
London NW11.

Quarts into pint pots

I OWN A 1K ZX-81 and look forward to your publication every month. I have noticed in the last few months that some of the programs for the 16K ZX-81 will work on the 1K. That is mainly because, when compiling the programs, various byte-saving techniques have not been used, e.g., SGN PI to equal 1 or not PI to equal 0 and so on.

So much so that the following programs, from your June issue, will in fact run on the 1K — Heavens Above, Codes, Space Supplies and Paranoid. Users of 1K should not give up because of a small memory. Check the listings of the 16K programs and re-write them slightly, maintaining all the important information.

David Hambly,
Ilford, Essex.

Tight fit is better

I WISH to reply to Chris Powell's letter in the May edition. I do not know what he means by 'the misuse of the Basic language'. First, any use other than as an introduction to computing is strictly a misuse and, second, misuse or otherwise, I found it very useful.

It has improved my programs because I can fit in much more. His saying the tips are bad habits is ridiculous, because anything which improves programs can only be good and so long as the inexperienced programmer knows what he is doing, nothing can go wrong.

I do not agree that the ZX-81 is 'cheap and easy' to expand to 16K. I had enough trouble getting the ZX-81. You have only to look at *Sinclair Programs* and the program pages in *Sinclair User* to see how many 1K ZX-81 owners there are.

Simon Brunning,
London SW17.

Programming blind

READERS may be interested to learn that there is a way of programming the Spectrum without showing the listing.

The blanking-out of the listing can be achieved by having as the line in one's program:
1 inverse video PRINT true video " " ENTER (Then Edit)
When the line has come back for EDITING
1 true video CAP/SHIFT 8 once inverse video PRINT " " ENTER

One will notice that on the edited version, when using inverse video just before the PRINT statement, a beep can be heard, which means it is operative.

D S J Crompton,
Bristol.

Tape pirates kill market

HAVING OWNED a Spectrum for several months, I feel that I must write on the topic of illegal tape copying. Since buying a Spectrum, I have encountered only a few fellow-users and more than several of them have offered to copy any tapes I would like for my own use.

If that small cross-section of users is typical of users nation-wide, I feel that something should be done to suppress the illegal activity.

The video industry has already experienced pirate videos and it seems that the software industry has a similar fate in store. The video industry has already taken steps against illegal copiers — heavy fines and imprisonment — and I hope those actions will not be necessary in the software industry.

Copiers must realise that what they are doing is not only illegal, contravening copyright, but also is killing the industry from which they are feeding. They are stealing from software houses and from the original writer, who will have spent many hours perfecting a program and will expect to profit from such work.

In most cases, only about £5 is saved on each tape in the short run and, compared to the prices of some tapes for games computers, such as Atari, which often cost £30, it seems a small price to pay for games which are often excellent and offer such enjoyment.

So I appeal that next time you see a game which appeals to you, instead of breaking the law by obtaining a copy, often of very poor quality anyway, spend a small sum and buy from a legal source.

J H Fletcher,
Wirral,
Merseyside.

Random expansion is not repeated

I AM SURE many readers will have found Andrew Hewson's solution to Stephen Maltby's problem — April issue — useful and educational. Unfortunately Hewson stuck to the strict terms of Weltby's problem of picking five random whole numbers between 1 and 10 without repetition and so restricted the elegance of what might have been a much more comprehensive routine.

Anyone who tried Hewson's routine would have found it impossible to use for more than 50 percent of solutions. I would be pleased if you would publish my solution which will randomise all whole random numbers from 1 to N without repetition.

The principle is to make a selection initially from N possibilities. This value, a (r) is put to the "back" of the array, in place of a (n) which is stored temporarily as S; a (r) can then be replaced by what was A (n) on the second pass through the loop contained in lines 50 to 90, a selection is made from n=r possibilities which is exchanged with A (n-r) and so on. The important difference from Hewson's solution is the progressive restriction of choice, as previous selections are 'stacked' from back to front of the array "a". Hewson attempts to make all elements of the array interchangeable which can obviously only be 50 percent successful.

Tony Rickwood,
Ilford, Essex.

Problems not exceptional

T LAYCOCK, of Fleet — letters June, — is not one-in-a-million. I have just returned my Spectrum, which failed to work with 48K programs despite spending a month at W H Smith's service department. My neighbour had three machines, all failing, and in disgust bought a BBC micro which works perfectly. I shall try once more but if that one fails — goodbye Sir Clive.

J Grabinar,
Bromley, Kent.

Signals from space

HAVING JUST become a 16K Spectrum owner and being a licensed radio amateur I would like to know if any of your readers has any idea or suggestion of how to achieve programming of computer-enhanced signals from deep space? I am thinking the easiest might be to enhance CW Morse signals.

On another front, having just obtained a printer, it strikes me that it must surely be usable as an ordinary recorder, such as for temperature, and a host of other applications where a record has to be kept of voltage or resistance changes — ECG, EEG. observations in plant physiology spring to mind.

An instrumentation amplifier would be required and the motor would have to be speed-controlled. I wonder has anybody done any work on this, such as doctoring the O/P or the Spectrum.

H H C Graepel,
Kinsale, Co. Cork,
Ireland.

challenge



7 8 9 10 11 12

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/ Spectrum software needs...

Spectre has good electronic drawing power

good Electronics drawing program for the 48K Spectrum. It contains all the symbols to allow you to design a digital or analogue circuit and COPY it on the printer. There are 62 symbols and each covers the area of one print square.

The program or circuit on its own may be SAVEd to tape to allow you to resume at any time where you left off. An interesting feature is that the program can activate the circuit. That checks and indicates the path of the 0V and the power supply round the circuit. It does not give voltages but checks for continuity, using the symbols as gates through which the current will or will not flow.

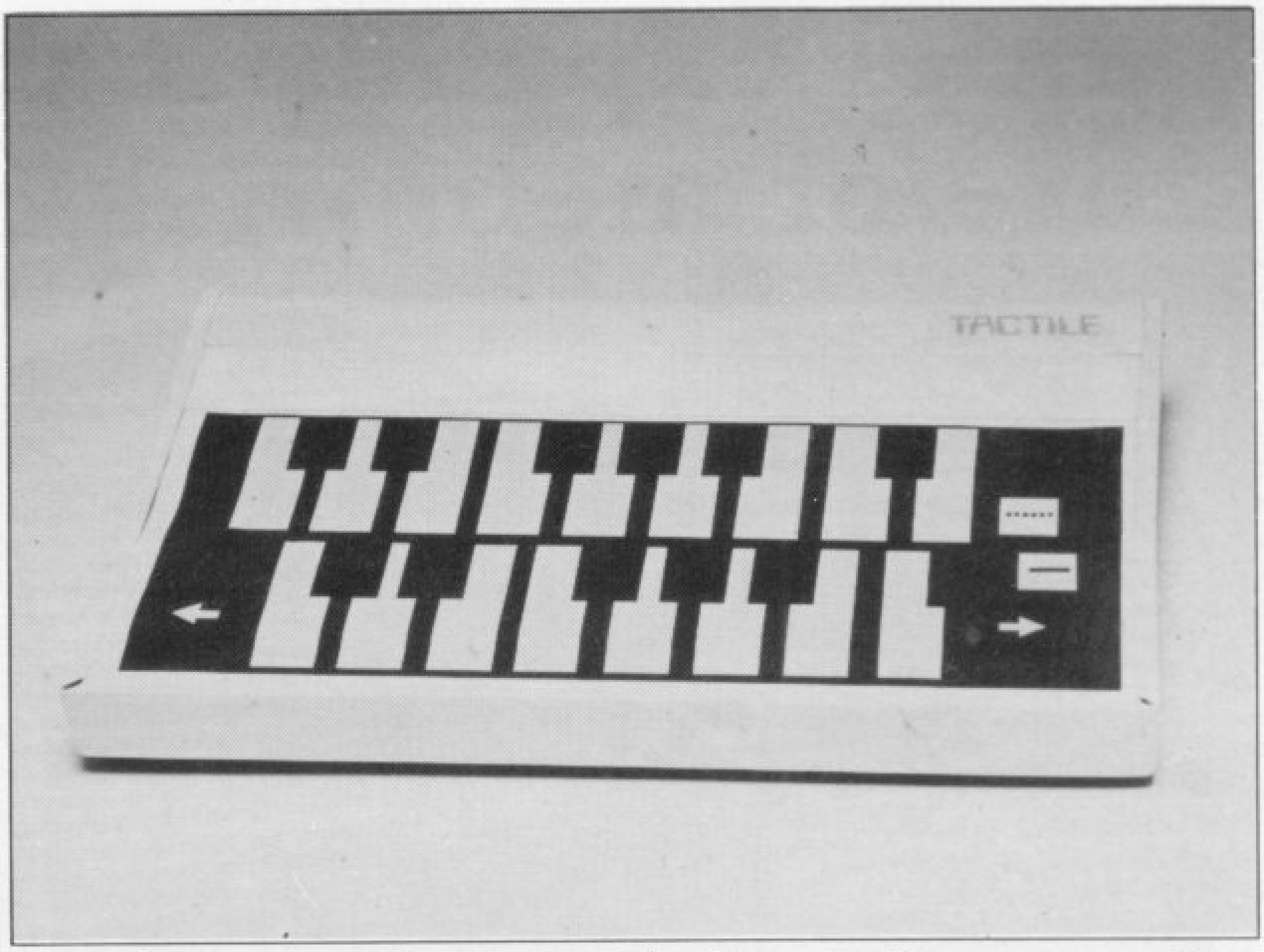
The supply current flow is shown in red and the 0V connections in green PRINT squares.

It is very slow — five to 10 minutes — but it can give a good indication if you have omitted some part. All the character set is re-programmed so if you BREAK the program you might find the listing a little difficult to follow.

It is a very useful program which could be enhanced with machine code to improve its abilities.

Electronics is the name of the program and the Spectre agent is at 2 Mull Close, Oakley, Basingstoke, Hampshire. The Spectre head office is in Hongkong.

Electronics will be sent anywhere in the world airmail at a cost of £6.95 and includes a money-back guarantee and technical advice.



Educational keyboard eases understanding

A VERY USEFUL device for young children is a Tactile keyboard which fits over the Spectrum keyboard. A plastic cover with a flexible top, the Tactile keyboard allows you to design a layout to fit a program.

Being a flat sheet, pictures or numbers can be placed over certain sections of the keyboard, so that children can be asked to "press the PEAR" and the like. The keys pressed can then be checked to see if the correct response has been given.

A piano keyboard is supplied already fixed to the keyboard and children find it fascinating as well as educational.

Programming tips are included so that a range of keys may be checked using Basic or machine code. Designs are made easier by the fact that a clear film can be used with overhead projector pens to trace pictures of objects direct from books and magazines. Early Learning Opportunities is producing software using the keyboard and a tape with a piano and a typewriter program is available from Tactile at £92.95. It is an important device for teaching children to use a computer. The keyboard costs £99.95 from Tactile, Wraith, 32 Elmfield, Kingswood, Bristol BS15 2SS.

Monitored tape copying made easy by Jiles

JILES ELECTRONICS has produced a tape copier which allows you to make back-up copies of software. It does not require a computer to use it but allows the computer to check what is happening by LOADing the program at the time it is being recorded.

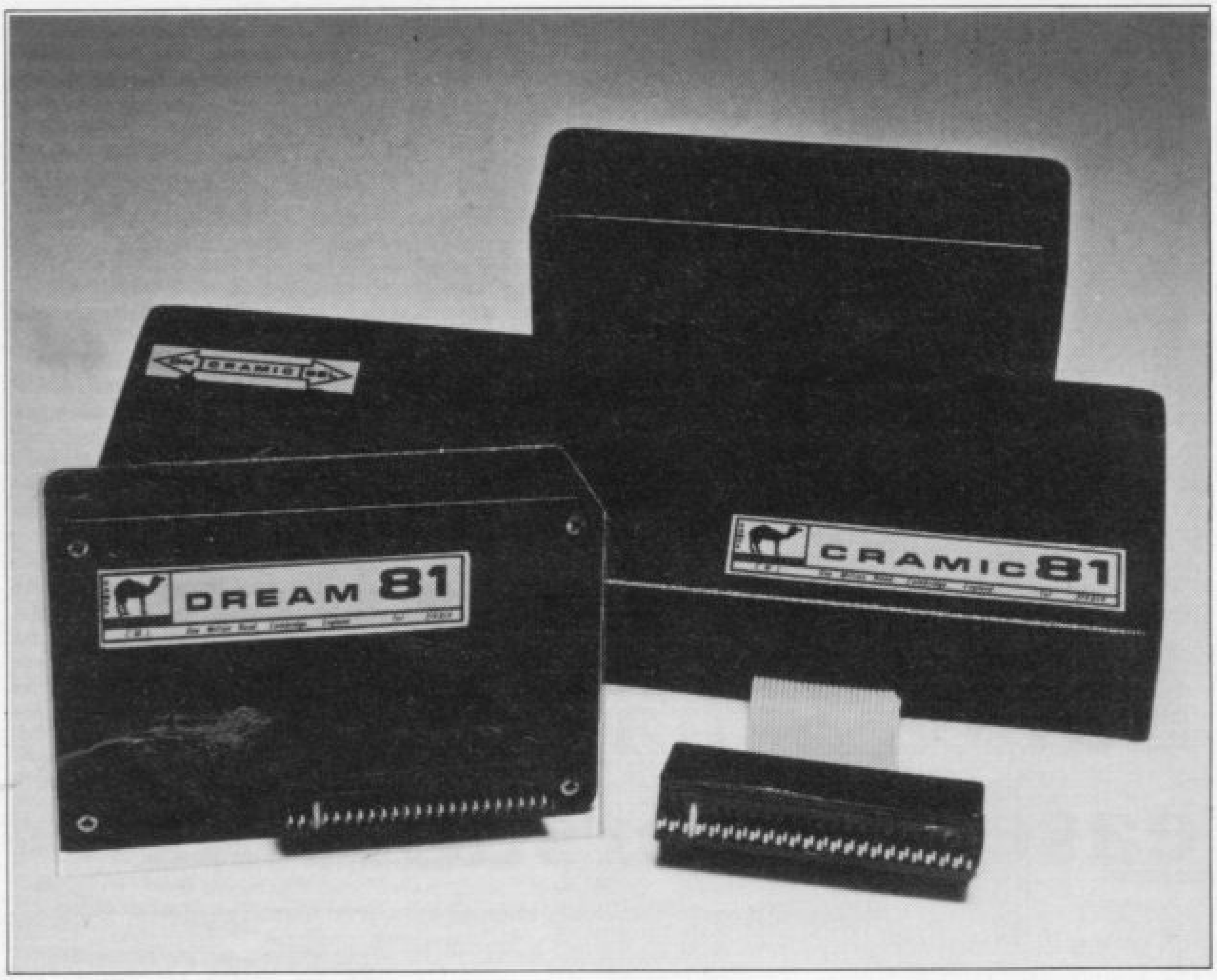
The device consists of a black plastic box with three sockets containing an amplifier and a battery.

The input socket is connected to the ear socket of the tape recorder and the output socket to the MIC of the second tape recorder. The LOAD socket is connected to the computer if required.

The volume is set at half on the tape recorder with the program in it and normal on the recorder. The recording process is then started with the computer monitoring the signal.

The tapes tested on the Spectrum and ZX-81 versions worked very well. Advice is given on how to align your tape recorder head and there are helpful hints if it does not work. The device is called the CO-DER and costs £99.95 from Jiles Electronics, 48 Parkway, Chellaston, Derby DE7 1QA. Tel: 0332 703892.

Camel expands its store of memories



THE CAMEL range by Cambridge Microelectronics has been expanded by three new ROM-type packs for the ZX-81. ROM-81 allows you to plug-in up to 8K of EPROMs into the two sockets provided — 2716 or 2732 types.

The memory area covered is selected by soldered straps inside the black plastic box.

The Dream 81 has 64K of RAM plus an EPROM socket which will take up to 16K of EPROM — 27128. The EPROM replaces the RAM between 8K and 16K on the memory map and permits the use of the slower 450ns EPROMs.

The 16K of the 27128 is split into two 8K areas switched in and out by a switch inside the pack, which makes it a little awkward as it is under the cover and not removable when using the machine.

The Cramic is a bigger version of the Memic (16K) which resides in parallel with the 16K RAM on a ZX-81. It can be used to capture and retain any 16K program. Used in conjunction with a 16K RAM pack it allows you to restore a program in seconds. The Cramic is bank-switched by a software I/O output instruction to ports 16 to 31.

The control of switching and copying of memory to the Cramic is done by a small machine code program in a REM statement at the beginning of each program and must be typed-in or run in from TAPE before using the pack.

The Passport program allows you to use the Cramic as a second program, switching between that and the original. Spare memory in another location will be required to swap variables between programs. The Cramic is housed in an 8¾in. × 1in. × 3in. black box which is attached to the ZX-81 by a flexible ribbon cable. An expansion connector is also provided at the back for the RAM pack.

The RAM consists of 6116-type memories backed-up by a lithium battery. The cover has two switches; SEL brings in the Cramic during a program and ON allows the Cramic to be put in parallel with the existing 16K RAM so that any program typed-in may be 'captured' by just de-selecting the Cramic. Unfortunately that crashes the program in RAM but re-inserting the machine code will bring it back as good as new.

The Cramic costs £91.95, ROM-81 £17.20 and the Dream-81 £80.45 from Cambridge Microelectronics Ltd, 1 Milton Road, Cambridge CB4 1UY. Tel: 0223-314814.

Processing the words

HILDERBAY has produced for the Spectrum a printer interface as well as software to run it, including a mini word processor. The black box has 23-way printer plug on the front and a ribbon cable of up to one metre ending in the usual Centronics-style plug. The box has no extender PCB, so any add-ons such as Microdrives must go between that and the printer interface.

The software is a Basic program and a small piece of machine code. The Basic program allows you to set up a series of options which are then incorporated into the machine code.

TASWORD can have the printer software inserted so that it uses another printer instead of the ZX printer.

The options on most printers are different but they can offer underline, emboldened or enlarged text using the graphics characters re-programmed to give control characters.

A COPY software routine is also included but not using the COPY command. All other commands are by the use of LLIST or LPRINT. There should be no need to go inside the printer to set up the CR/LF options as they can be set from the software.

It is a very good combination of hardware and software at £45. Hilderbay Ltd, 8-10 Parkway, London NW1 7AA. Tel: 01-485 1059.

Audio action

COMPUSOUND, which produces the audio modulator for the ZX-81, Spectrum and other computers is taking action against Kayde for allegedly copying its Telesound 84 which has a patent pending. The Kayde module first appeared at the Midlands Computer Show in April.

Modem allows ZX-81s to speak to each other

MAPLINS has two kits of interest to the ZX-81 user and both can be used to provide an on-line 300-baud modem. The first, which is the modem, was issued as a kit in February, but until now the RS232 and the software was not available to use it.

The important thing about 300-baud working against Prestel is that it is used commercially to obtain information from databases for which you have to pay a fee and also you can communicate with other computer users who do not have ZX-81s. Free databases or bulletin boards are also available; a list of them can be obtained from the Association of Computer Clubs.

The modem is not the easiest of kits to build as it uses a five-band resistor colour code but if you follow the instructions to the letter the kit can be assembled without too much difficulty. The problem is in setting-up the modem and connecting it to a telephone line.

To set up the modem an oscilloscope is essential, except that it is difficult to set up accurately. Most of the controls can be set up using a sensitive voltmeter but to check the mark space ratio the modem is best looped back to itself and, using the RS232, sending Us until Us return on the screen.

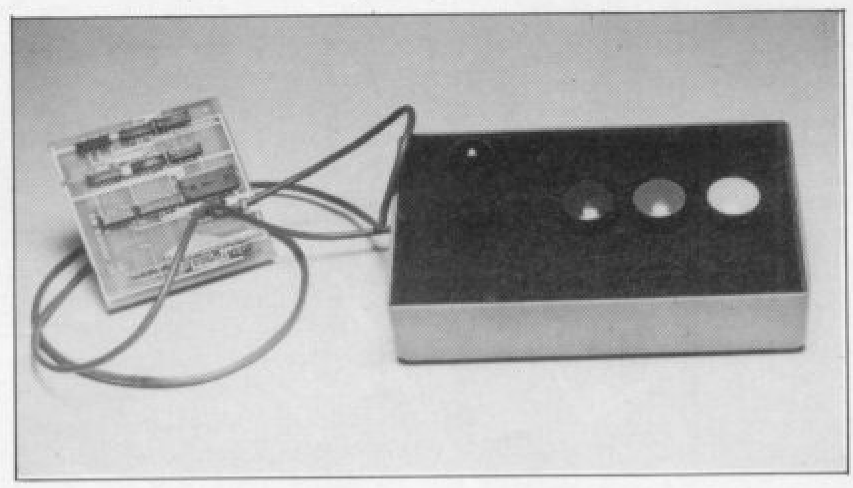
Having set up the modem, a plug and socket must be ordered from British Telecom to connect it to the line. Once connected to the telephone line, you can telephone Maplins and order components, check your item is in stock and if you are using a credit card, pay for it.

The RS232 kit is much easier to build but you will require a motherboard and at least 2K of RAM to run the terminal program — the program to talk to the modem. The software is stored on tape and conversion is made to ASCII characters by using an EPROM. The RS232 can also be used to run a printer or to talk to another computer which has an RS232.

The RS232 interface cannot produce negative voltages, so full implementation of the standard is not possible.

The modem costs £40.45, RS232 interface kit £25.45, motherboard £8.45, modem case £7.85. Maplins is at PO Box 3, Rayleigh, Essex SS6 8LR. Tel: 0702-552911.

Programming a joystick



ELECTROTECH has produced a large box containing a programmable joystick and three large push-buttons. In appearance it looks very similar to the large games machine controls. A printed circuit board which contains a 2K RAM plugs into the back of the Spectrum. It is used to store the information on what keys to operate when the joystick switches are operated.

There are eight positions on the joystick as the corners also operate both switches. Whether that will be useful or confusing will depend on the game. All the micro-switches are large professional types which should last a long time. That also explains the cost of the joystick, expensive at £43.70 for the standard model.

A tape which accompanies the joystick is a Basic program which allows you to program the joystick and SAVE the results on to tapes as a machine code file.

It allows you to re-load the key combinations for a game without the slow process of the Basic program.

The keyboard is not affected and can be used as well as the joystick for entering the score. Seven functions can be programmed — three switches and a four position joystick.

The cost might suit some shops which wear out joysticks very quickly but there seem to be cheaper alternatives for the average user.

Electrotech is at 2 Heath Close, Winston Hill, Luton, Beds. Tel: 0582-429809.

Tidying spectrums

THE PRINT 'n' Plotter console is a cardboard stand for the Spectrum, printer and power supply. The console arrives packed flat and can be constructed easily into a solid, vinyl-covered box in about half an hour. The instructions are clear and simple and there is an alternative of housing four tapes instead of the printer. Cutouts are provided at the back for tape and TV power supply and a ventilation slot under the Spectrum heatsink. It is necessary to tidy-up with a black felt-tip pen on the corners where the vinyl has been cut. Those edges could also be covered with adhesive tape to prevent them wearing.

The only disadvantage seems to be that no peripherals will fit directly into the Spectrum except the printer because of the ¾in. distance between the computer and edge of the console. Modifications, however, can be made with a sharp knife.

It is an inexpensive box into which you can put your Spectrum; it tilts it to the correct angle for typing and allows the power pack to be stored inside. By raising the height a slim tape recorder can also be put inside the box.

Print 'n' Plotter consoles cost £8.25 from Print 'n' Plotter Products, 49 Borough High Street, London SE1 9SE.

Controller

KEMPSTON Microelectronics has produced a conversion tape for six of the most popular games which allows you to convert the game for use with its joysticks. It has also included a machine code version of COPY in the latest release of software for the printer interface, called by a USR command.

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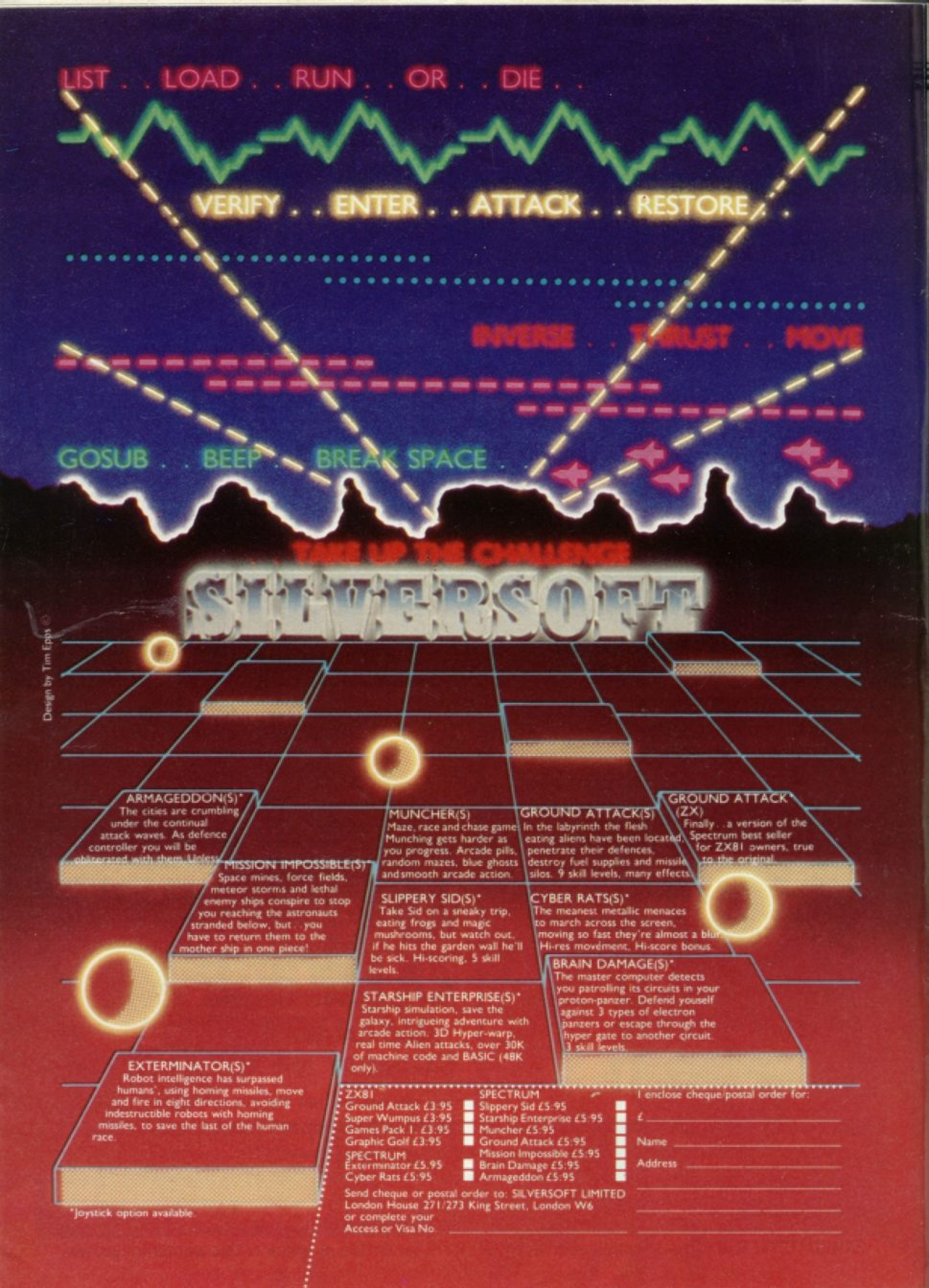
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Teaching aid is impressive

THE NUMBER of educational programs for the 16K ZX-81 is growing but there is still room on the market for good-quality programs such as **Spelling Bee.**

When the program is run the ZX-81 displays a very detailed picture of a bush, a hive and a hyperactive bee which flies between them. The student is then asked to select the spelling.

The first level is the easiest. You are asked to name objects which appear on the screen. The computer starts with a bee and continues by displaying pigs, trees and even a gate.

The second level is slightly more difficult. The computer asks you to spell five-letter names. If you have most of them correct the computer displays a birthday cake with candles glowing on the top.

The difficulty level increases although the same pictures are shown but the computer highlights a part of the picture and asks you to name that part. It could be the arm of a chair or the wing of a bee.

Spelling Bee uses very impressive graphics and is ideal for a young child learning to spell. The package is produced by Image Software, 185 Elm Road, New Malden, Surrey KT3 3HX. It costs £5.



Spaced-out collection

ALIEN RAIN and **Outraider** are two games on one cassette for the 16K ZX-81. In **Alien Rain** you control a little man at the bottom of the screen. Home is at the left of the screen and the object of your quest lies at the right, in a cave.

The little man must run from the left to the right, rescue an alien, and return home. Points are gained for the number of aliens rescued.

The only obstacles endangering the little man's mercy mission are thousands of evil invaders which rain from the heavens. If you are hit by one a life is deducted from the three lives allowed at the beginning of the game.

At first you are protected by three shields which the invaders destroy slowly. Those defences will give you time to rush backwards and forwards, rescuing as many aliens as possible.

The game runs at nine levels; the ninth is fairly slow but the first is very fast.

The graphics are impressive and even the title pages have been designed for the best effects.

The second game on the cassette is **Outraider.** It is your job to protect the grey area in the middle of the screen. To do so you are given a spaceship which can be rotated to face the assaults of enemy craft which are out to destroy the grey area.

When the main hull of the mothership has been penetrated and an enemy ship has sent a missile into the grey area the game is over.

The concept of Alien Rain is original and the game is fast. It is something which can be played again and again. Outraider is interesting as you need to use only one key control to play. The games have a quality about them which would attract even a Spectrum owner.

The cassette is available from Computer Rentals Ltd., 140 Whitechapel Road, London, E1. It costs £3.50.

Good but may perhaps be late

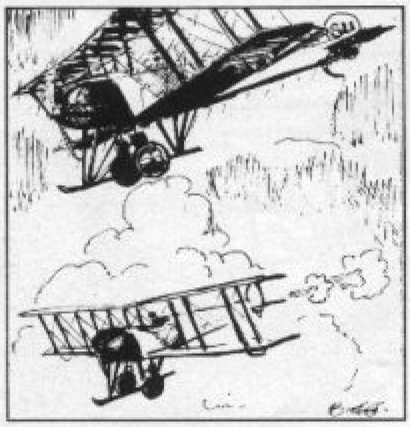
IT IS UNFORTUNATE that **Maze Guzzler** and **Super Breakout** have been released so late, as they are both good games. Putting any traditional game on to the 1K ZX-81 is still an occupation pursued by some software houses but there are so many copies of Breakout and Pacman on the market already that software houses should concentrate on something more original.

Maze Guzzler is the Pacman game on this tape. It includes all the usual features of fairly intelligent ghosts, energy pills and on-screen scoring.



The maze is put up at the beginning of the game but you have to press the RUN key to start the ghosts and your guzzler moving around the maze. You have four chances at clearing the mazes of the life-giving dots. If you manage to stay in the game for long enough you will find that the action becomes faster. The ghosts seem to be dopey at times but they usually get the guzzler in the end. The game on the other side of the cassette is called Super Breakout. It consists of bouncing a ball against a brick wall and the bricks fall out as they are hit. If you miss the ball on its return you lose one of your four lives.

Maze Guzzler and Super Breakout will give hours of fun to people who have 1K ZX-81s. The cassette costs £3.50 from Selec Software, 37 Councillor Lane, Cheadle, Cheshire.



New firm crashes in

YOUR SPACESHIP crashes on to a forbidding planet, damaging your propulsion and navigation systems. To obtain the Grittan Stones, necessary to have those systems working again, you must enter the robots' city.

In the city are evil robots which will try to kill you, using large magenta balls to smash you to pieces. The green robots are the King Tobors, indestructible killers which you cannot defeat.

Tobor is a game for the 16K and 48K Spectrum from a new company, Elfin Software. The player moves round a succession of mazes, outwitting and destroying the robots which are in pursuit. You can use your laser gun only when on the move and can fire only in the direction in which you are running. When you die the robots are kind enough to erect a tombstone with RIP on it at the place where you fell.

Elfin certainly is a company to watch as, judging by its first game, it is keen to produce top-quality software. One small reservation we had about the game, however, was that the instructions and title pages were loaded in sections and that took a long time. A player does not want to have to watch two or three minutes of graphics before playing the game every time it is loaded.

Tobor is available from Elfin Software, Hudsons House, Battery Road, Great Yarmouth, NR30 3NN. It costs £5.95.

Halls of Things could be a danger to health

HALLS OF THINGS for the 48K Spectrum is a game which could change the Spectrum games scene overnight.

The program is technically excellent and dangerously addictive, although you can forget about high scores until you become adept.

You play a little man who must rush up and down the stairs to different levels of a maze in which several magic rings can be found. The problem is that some little space invader-type creatures are out to get you with their fireballs and lightning. You can fight them with your fireballs, lightning and sword. You can also heal the wounds which have been inflicted on you by using magic, of which you have a limited amount.

The screen display makes it even more impressive. It looks as if the game is running on an Apple 2E or UK-101, both computers more expensive than the Spectrum. The game is bound to be a hit apart from one criticism. **Halls of Things** has no sound. The fights between Things and the hero could be made even more dramatic with the addition of lightning zaps or explosions.

Cosmic Guerrilla is an arcade game which is also produced by Crystal Computing for the Spectrum.

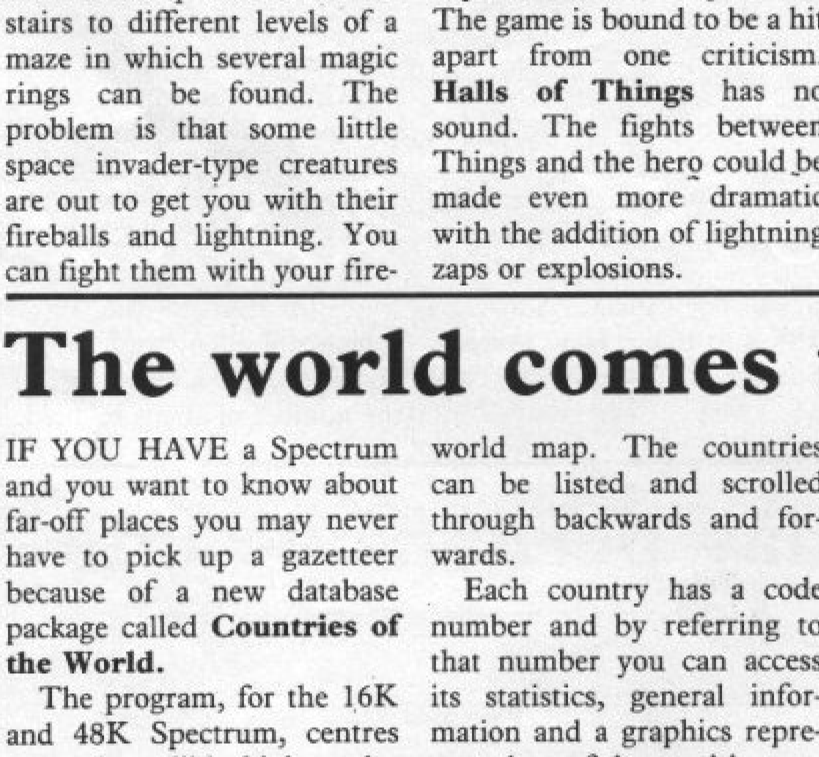
You have three spaceships to save and, depending on how far you proceed in the game, the aliens mutate from ordinary space invaders to cosmic pigs. The sound and graphics combine to make the game good fun and easy to play. Halls of Things costs £6.50 and Cosmic Guerrilla £5.95. Both cassettes can be obtained from Crystal Computing, 2 Ashton Way, East Herrington, Sunderland, SR3 3RX.

The world comes to visit

IF YOU HAVE a Spectrum and you want to know about far-off places you may never have to pick up a gazetteer because of a new database package called **Countries of the World.**

The program, for the 16K and 48K Spectrum, centres on an incredible high-resolution colour drawing of a world map. The countries can be listed and scrolled through backwards and forwards.

Each country has a code number and by referring to that number you can access its statistics, general information and a graphics representation of its position on the globe.



The detail in the program is very fine but some points made about countries are inaccurate. For instance, the program gives the capital of Andorra as Andorra-La-Viella, where it should be Andorra-La-Vella. Little mistakes like that spoil the program.

Another new release is **Maze Chase.** The program is in the Pac-man mould but is very addictive and difficult to play.

The manufacturer says the game has four mazes on the 16K version and 12 on the 48K. We have managed to get through only the first few mazes as the game is so difficult.

The player must eat the energy pills and lemons while staying away from the evil guardians. If a magic strawberry is eaten the guardians will lose their power and you can eat them.

Maze Chase and Countries of the World are available from Hewson Consultants, 7 Graham Close, Blewbury, Oxon. Maze Chase costs £4.95 and Countries of the World £5.95.

Cracking the EGG is no joke

WHEN YOU HEAR that the universe is being threatened by a giant Ectogenetic Galactic Gamate — EGG to all you intelligent people — you may decide to catch the next bus out of the Universe.

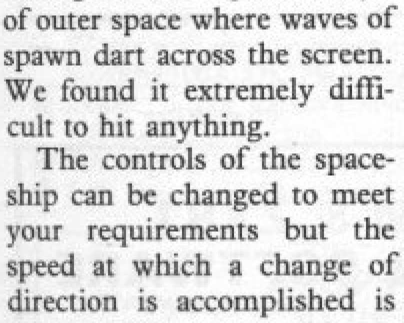
In **Spawn of Evil,** however, a new game for the 16K Spectrum, you decide to fight and promptly put your spaceship into attack mode. Your job is not only to destroy the EGG before it becomes indestructible but also to kill all the Pulsoids, Cycloids and Aliens which breed from it.

The software is in two parts and each part can be run independently.

Your spaceship glides through a 3D representation of outer space where waves of spawn dart across the screen. We found it extremely difficult to hit anything.

The controls of the spaceship can be changed to meet your requirements but the speed at which a change of direction is accomplished is so slow that we could not hold many pulsoids in our gun sites long enough to fire a laser blast.

Despite the difficulty of getting used to, Spawn of Evil is a well-presented and graphically-impressive package. It can be obtained for £4.95 from dK'Tronics, Unit 2, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ.





Picking clubs at Troon

THERE ARE MANY games of golf on the market but none simulates the rolling greens and deep bunkers of **Troon.** The game is for the 48K Spectrum and provides a graphic representation of the 18-hole championship course. You do not have to be an expert golfer to play it but making a shot requires slightly more golfing skill than just guessing the co-ordinates of the hole for which you are aiming.

The graphics in the game are cleverly-used and well-produced. When teeing-off the player will see an aerial view of the next hole, along with trees, lakes, green and rough. As the ball gets nearer the hole a close-up view of the hole, complete with flag, is shown.

The range of clubs you can use seems almost infinite and the game gives a list of those clubs on-screen to help you choose which you want to use.

You can let all your friends or family join the championship game to see who is the best player. The game is relatively user-friendly, so you do not have to have a set of golf clubs stored in the cupboard to be able to play it.

Troon is a very complex game and one of the only games of golf on the market which features club selection. It can be obtained from Hornby Software, 21 Pinfold Hill, Leeds LS15 0PW and costs £6.95.

Oiling the wheels ensures success

IF YOU HATE J R Ewing and would like to take over his corporation you will like **Dallas**, a game for the 48K Spectrum from CCS Software.

You are in charge of a new oil company which must make $200 million in nett assets and $80 million to take-over Euing Associates. There are three levels of difficulty but at each level you must buy a concession of land, put a moving rig on it, start drilling until you find oil, and then go into production.

To make the kind of money needed to take-over Euing you will have to build production plants on at least three concessions to make sufficient profit. If you do not you could be bankrupt. As with any good simulation game there are hazards with which you must deal. Tornados may destroy your rig, drilling accidents may occur and the taxman may call for very large amounts of cash.

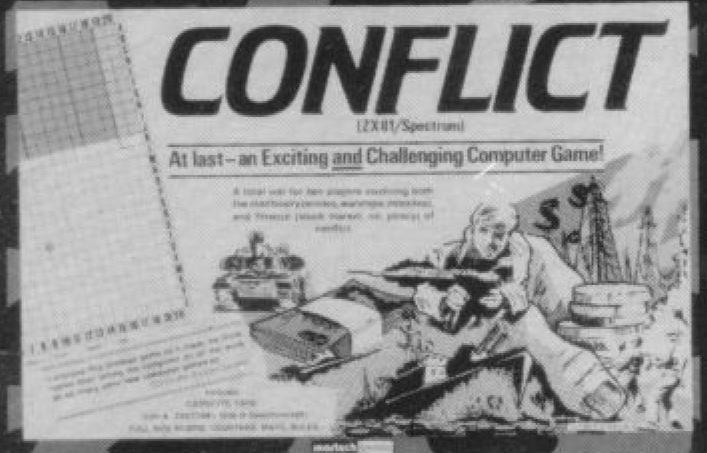
Dallas is an engrossing game and needs several hours' play to complete successfully. It is a game which all the family will want to play as it is guaranteed to turn even the youngest youngster into a megalomaniac who needs a regular dose of power and money in the game.

Dallas can be obtained from CCS Software, 14 Langton Way, London SE3 7TL. It costs £6.

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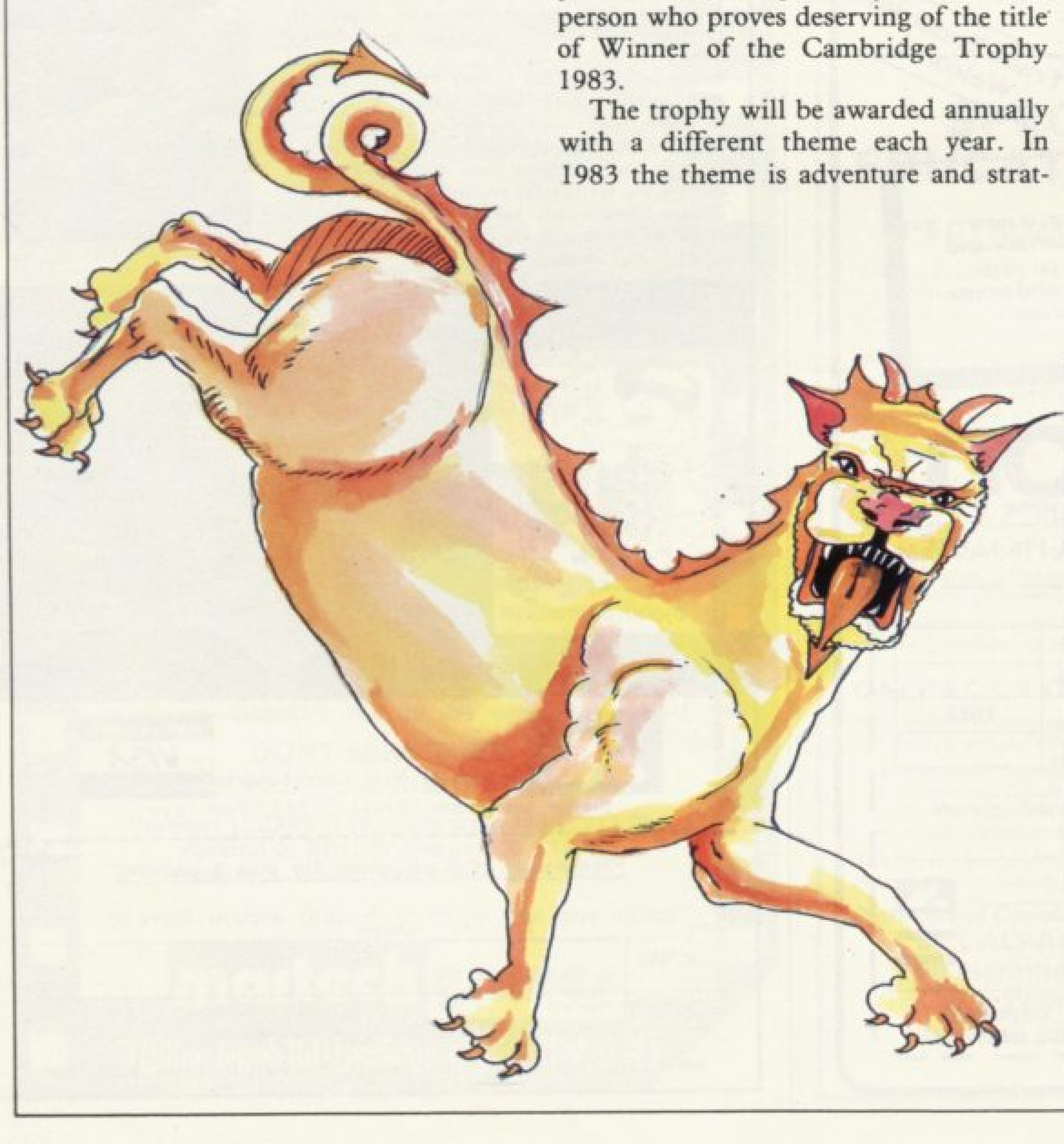
In this new competition, the Cambridge Trophy, sponsored jointly by *Sinclair User* and Computer Cases Simulation Ltd, we are searching for the best writers of programs for the Spectrum and ZX-81. We are offering a first prize of £1,000 plus royalties to the person who proves deserving of the title of Winner of the Cambridge Trophy 1983.

The trophy will be awarded annually with a different theme each year. In 1983 the theme is adventure and strategy games. The judges will be looking for a number of factors when making their decision. They include:

Instructions
Program documentation
Graphics and sound
Playability
Lasting appeal
Innovation
Use of machine.

As well as the first prize of £1,000, which can be won by programs for either the Spectrum or the ZX-81, there will be two second prizes of £250, one for the Spectrum and the other for the ZX-81. Similarly there will be two third prizes of £100. In addition there will be 10 runners-up prizes for each machine, consisting of five CCS programs and a free annual subscription to *Sinclair User*.

Fill in the form for your passport to fame and fortune.



- Entries must be on cassette accompanied by a listing, detailed explanation of the program and an entry form. Entrants must warrant that their programs are original.
- Programs only for the Spectrum and ZX-81 will be considered.
- Entries must reach *Sinclair User* at 30-31 Islington Green, London N1 8BJ, by Tuesday, September 20.
- Results will be announced at the Christmas ZX-Microfair in December.
- The entrant assigns CCS the exclusive licence with the right to sub-licence, to copy, modify, sell and publish the original or modified program in any form and CCS undertakes to pay a *royalty* fee of 20 percent of the nett invoice price on the sale of such program(s) and further will pay a fee of £10 in respect of each publication of the respective program listing. CCS assigns





ECC Publications the exclusive world-wide rights to publish the listings of all entries.

- The winning programs shall become the property of CCS, which undertakes to market the programs and to pay the winner a royalty and fees as detailed.
- The organisers retain the right to offer any entries for use by Micronet on an agreed royalty basis.
- Entries will not be returned.
- The judges' decision is final.
- No correspondence can be entered into between entrants and the organisers.
- Employees of ECC Publications and CCS and their associated companies may not enter.

The award will be judged by three people well-known in the world of Sinclair computers—Mike Johnston, organiser of the highly-popular ZX Microfairs and consultant editor of *Sinclair User;* Trevor Toms, author of a number of books on the Spectrum and the ZX-81; and John Gilbert, *Sinclair User* software reviewer. The panel will be chaired by Nigel Clark, editor of *Sinclair User,* and Melvin Lloyd-Jones, a director of CCS.

ENTRY FORM

I agree to abide by the rules of the competition.

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Address ....

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Send your entries to ECC Publications, 30–31 Islington Green, London N1 8BJ.

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Strategy Games.
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Enter our programming competition. Details page 36–37.

sinclair special 1



Inside...
Latest prices round-up...
Latest software...
Order form...

Introduction

One thing's certain about the Sinclair world – there's never a dull moment.

Every month sees new software and new hardware, produced by Sinclair enthusiasts, or produced by Sinclair itself.

The magazines do a fantastic job of keeping you up to date with the input of enthusiasts. We want to keep you in touch with Sinclair's own developments.

Every month, there'll be a Sinclair Special in this magazine.

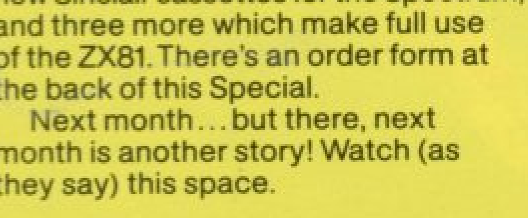
Sometimes, inevitably, there won't be anything new to say – we want to break away from the breathless announcements of hardware and software you just can't buy.

But when something new *is* available, we want you to have accurate information – fast. You'll find it here.

This month, we're giving you the latest information on the recommended retail prices of Sinclair equipment. They're *our* prices, and you may well find things cheaper (or dearer) in the shops. If they're cheaper – terrific! Snap them up. Note, however, that from us the ZX81 is down to £39.95.

We're also announcing six superb new Sinclair cassettes for the Spectrum, and three more which make full use of the ZX81. There's an order form at the back of this Special.

Next month... but there, next month is another story! Watch (as they say) this space.



Nigel Searle.
Managing Director,
Sinclair Research Ltd.



Spectrum – latest recommended retail prices.

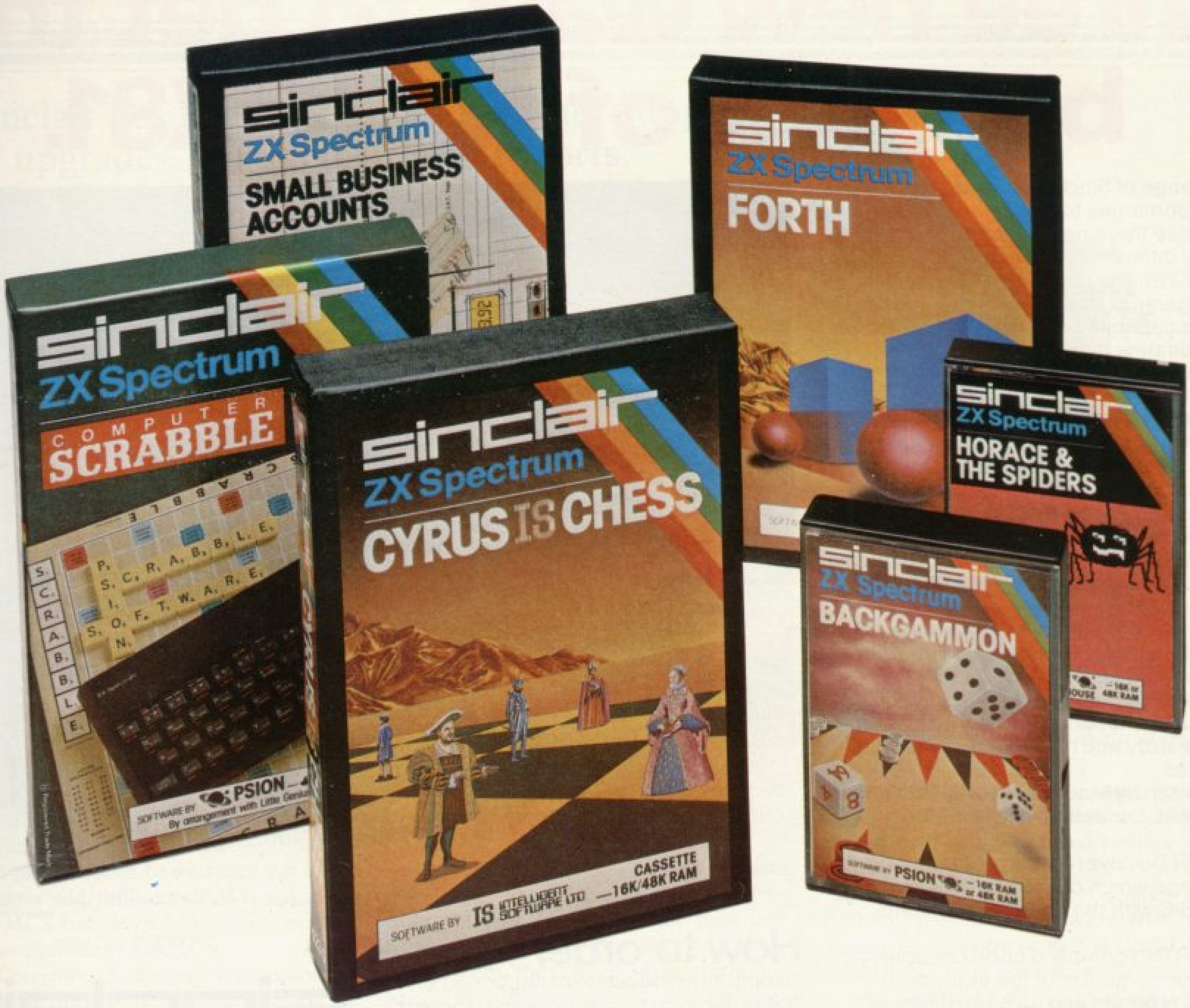


16K was £125.00
16K now £99.95

48K was £175.00
48K now £129.95

ZX Printer was £59.95 — **ZX Printer now £39.95**

ZX81 was £49.95 — **ZX81 now £39.95**



Six new ways to make more of your Spectrum.

Take a look at these brand-new titles. Each is an outstanding new program using the full potential of the Spectrum, for games with stunningly animated graphics, for strategies of fiendish cunning, for masterly applications of computing capability...

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FORTH Learn a new programming language, as simple as BASIC, but with the speed of machine code. Complete with Editor and User manual. For 48K RAM Spectrum.

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Overleaf–your Sinclair order form.

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Sabotage Defender or attacker? The choice is yours in this exciting game.

Be the Guard and defend the randomly placed boxes of ammunition inside the compound – or be the Sabateur and attack the ammunition!

Written by Macronics for a ZX81 with 16K RAM. Cassette price: £4.95.

City Patrol You are the Commander of a laser-firing ship. Your task is to intercept and destroy alien suicide ships descending on your city. Judge your rating as Commander by how many aliens you destroy and how much of your city survives.

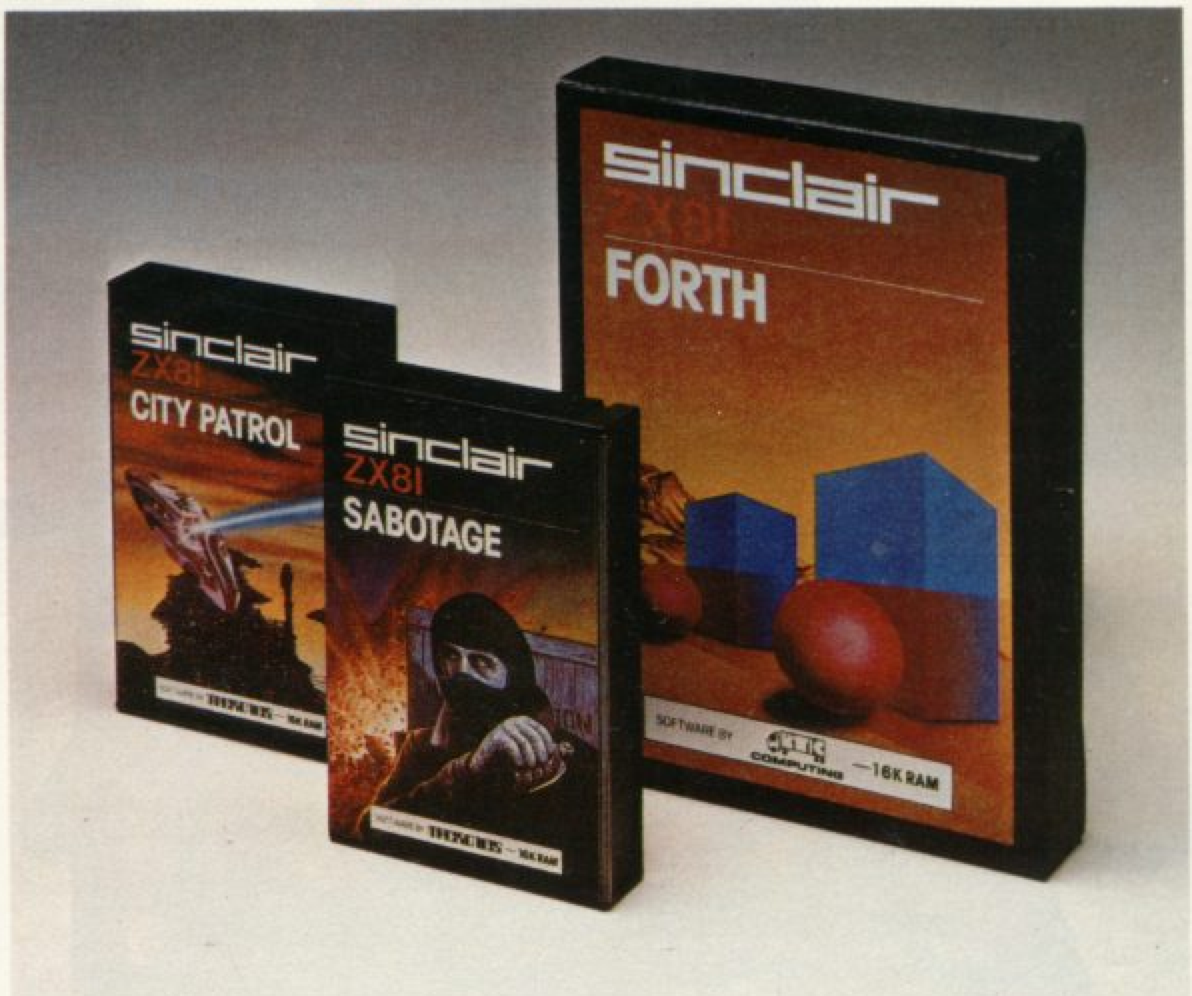
Written by Macronics for a ZX81 with 16K RAM. Cassette price: £4.95.

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Section A: hardware purchase

Qty	Item	Code	Item Price £	Total £
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	ZX 81 (including 1.2A Mains Adaptor)	1003	39.95	
	16K RAM pack for ZX81	1010	29.95	
	ZX Printer	1014	39.95	
	1.2A Mains Adaptor, for use with ZX81 computer/ZX Printer combination (only required if you have an early ZX81 with 0.7A Adaptor)	1002	7.95	
	Printer paper (pack of 5 rolls)	1008	11.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			TOTAL £	

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	G23/S:Cyrus-IS-Chess	4023	9.95	
	G24/S:Horace & the Spiders	4022	5.95	
	G25/S:Scrabble	4024	15.95	
	L1 /S:FORTH	4400	14.95	
	B6 /S:Small Business Accounts	4605	12.95	
	FOR ZX81			
	G25: Sabotage	2124	4.95	
	G24: City Patrol	2123	4.95	
	L1: FORTH	2400	14.95	
			TOTAL £	

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*Delete/complete as applicable. (Please print)

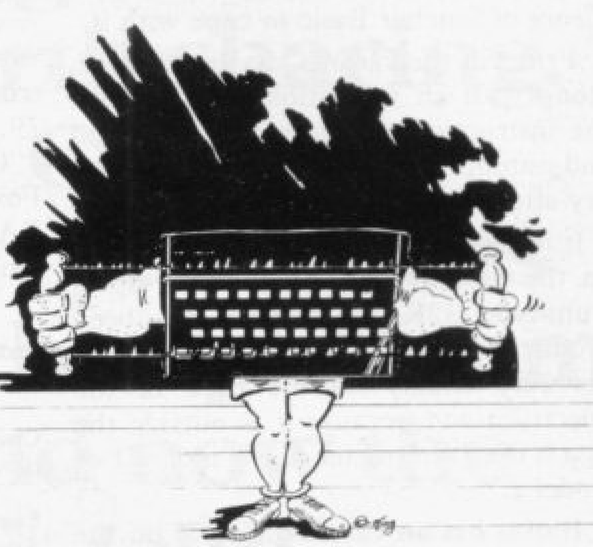
Signature

Mr/Mrs/Miss

Address

SUS 908

Sinclair has been overtaken by other suppliers of upgrades. Stephen Adams reports.



Spectrum finds itself at full stretch

THE SPECTRUM is in four basic forms. Model 1s which have two IC-type sockets into which a printed circuit board is plugged and model 2s which have all the RAM fitted on to the main printed circuit board. There are, of course, two types in each category, the 48K and the 16K.

The 48K cannot be expanded, as all the existing memory space is covered with either ROM or RAM — all 64K of it. The ROM can be switched-out externally to add different ROMs using the $\overline{\text{ROMCS}}$ but the RAM cannot as there is no equivalent $\overline{\text{RAMCS}}$.

Therefore all memory expansions can be done only to the 16K models. As the computer already contains 16K of RAM, the top 32K of memory area — 32K-64K — is the only space to put it. Most memory expansions fill that space with 32K worth of RAM chips but the East London Robotics 64K add-on — the SP80 — has two sets of 32K RAM which can be switched in and out under a program instruction or from the keyboard.

The kits consist of four memory-decoding chips, except model 1 versions where all the chips are soldered to a PCB, and eight 32K by one-bit chips. Those RAM chips are very sensitive to static electricity and warnings are included in all the instruction sheets. The way to handle them properly is not to remove them from their protective packaging until needed and to keep touching an earthed object such as a radiator or gas pipe occasionally to release the static charge. The static can be caused by nylon or wool in your clothing being rubbed.

Putting-in the chips can be a little difficult and it is recommended that you check that the pins are straight before you insert them. The Fox Electronics kit has the pins already straightened. Also check that none of the pins is bent outside the socket or underneath the chip when you have finished.

The best technique to use is to put all the pins on one side into the socket and then to pull the pins on the other side over the holes in the other side of the socket. Once both sets of pins are resting in the socket holes you can push down gently on the chip to push it into its socket.

The instructions vary from a four-page, step-by-step meticulous description by Delta Research to one page just listing where the chips go by Fuller. Apart from the Fuller instructions all provided sufficient detail to allow you to know where each chip goes and what precautions to take.

As part of its instructions Fox Electronics also includes a sheet showing how to tune the colour on a Spectrum to give better results. It also shows you how to tell whether it is the Spectrum or the TV set causing a problem. Sheets normally cost £1 from Fountain Electronics but are free with its RAM kit, along with a small Basic program to demonstrate the usefulness of 48K.

> 'The 48K cannot be expanded'

The fitting of the Fox kit was the easiest but if you have problems you can send back the kit with the details of the Spectrum at any time in the following 12 months. East London Robotics will fit the chips at an extra cost of £7 by post or £3 by personal visit.

Delta sends a memory test tape which checks all the memory by using a machine code program going through at least all the manufacturer's specifications. The tape can be used to keep an eye on suspect memory faults as it stops with an error which can then be sent back to Delta or Sinclair. The tape normally would cost £3.50 and is a really comprehensive test taking at least eight minutes.

East London Robotics and Delta were the only model 1 boards we could test and both could be fitted easily with less trouble than the model 2.

East London Robotics also does an SP80 kit which can provide 64K of memory in the same sockets as the SP48 (48K) fitted. That is achieved by having two separate banks of 32K, switched by an OUT instruction.

That is possible only because of the 64K RAM chips which are used instead of the 32K RAMs and a massive modification of the decoding chips which plug into the Spectrum. No soldering is required but some care needs to be taken inserting the chips, as three of them are wired together using twisted insulated wire.

A LED is also soldered on to one of the chips to indicate which bank is being used. The only problem is that you can see it only with the top off or looking through the edge-connector hole. The LED lights when it is in bank two and when the machine is turned on the light shows on bank one.

The only problem with the SP80 is that the stack and any program running in it must be in the 16K of memory provided by Sinclair. If it was allowed to go into the top 32K it would be switched-out on the first OUT instruction and the program would have nowhere to go.

Also the machine code stack for return addresses would have to be in the lower 16K area for the same reason. That leaves the user to develop a pro-

gram which will be able to use banks of memory without having the convenience of Sinclair Basic to cope with it.

Prices of the various kits are detailed, along with an indication of how good the instructions were, guarantee period and number of tests performed on memory after fitting.

It is also possible to add a RAM pack on the back of the Spectrum. A Spectrum-type 32K RAM pack has been produced by Cheetah Marketing Ltd. It fits very snugly on the back of the Spectrum and because it is outside the case it does not matter if it is model 1 or model 2.

It also has an extension piece on the back so that you can plug in Microdrives when they arrive. The RAM pack has no known wobble in use and can be fitted very easily by plugging it into the expansion port. It costs £39.95.

The alternative is to use a ZX-81-type RAM pack with an adaptor to give you another 16K or 32K. To use it you will require an adaptor.

EPROM Services and myself both make adaptors for the 16K RAM pack. Mine can also cope with a 64K RAM pack to give a full 32K by changing a soldered strap on the board or ordering a 64K version. I also produce an Adam II which lets you have a 16K RAM pack on the back of the Spectrum but which also allows devices which used to work in the popular 8K-16K region to work in the 56-64K region of the Spectrum. All the adaptors mentioned cost £9.

Of the RAM packs and kits reviewed. Fox Electronics for kits and Cheetah for RAM packs stand out as good value for money.

Fox Electronics, 141 Abbey Road, Basingstoke, Hampshire. Tel: 0256-20671

Cheetah Marketing, 359 The Strand, London WC2 0HS. Tel: 01-240-7939.

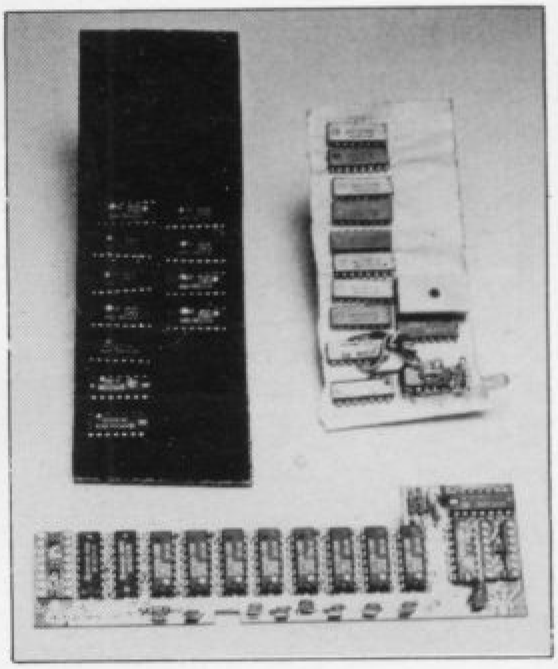
East London Robotics, No. 11 Gate, Royal Albert Docks, London E16. Tel: 01-471-3308.

Delta Research — cheques to Servodata Ltd — 15 Church Street, Basingstoke, Hampshire. Tel: 0635-45373.

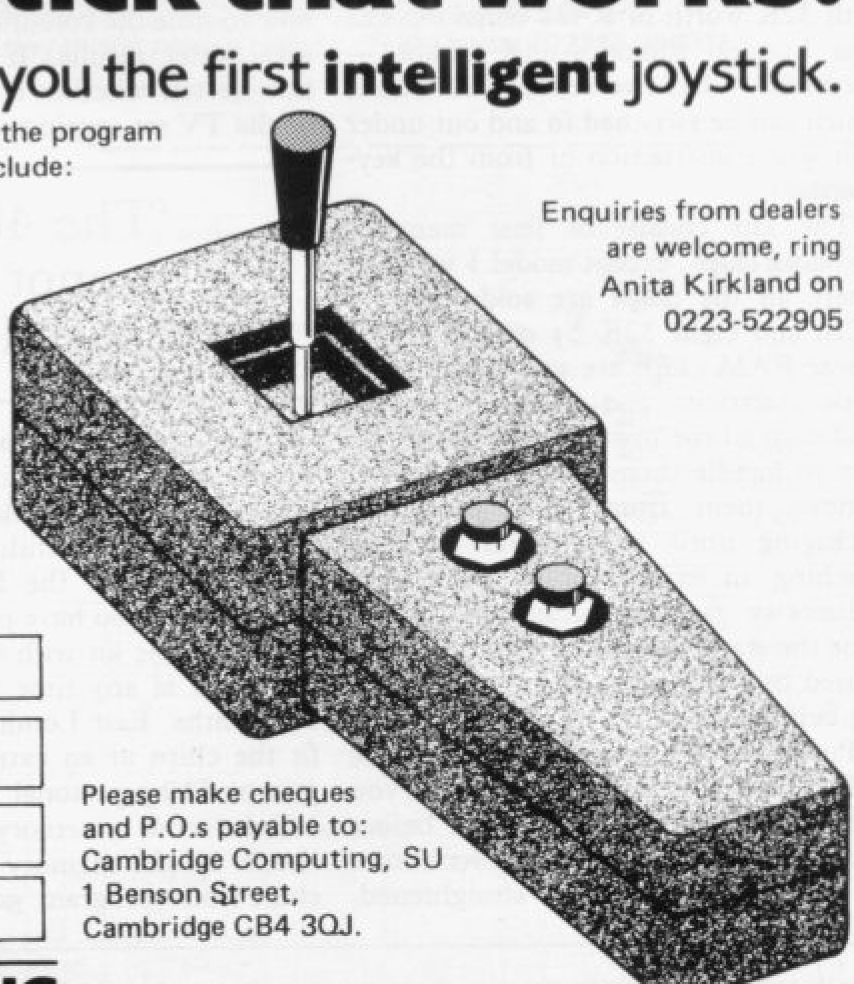
Fuller Micro Systems, 71 Dale Street, Liverpool 2.

Eprom Services, 3 Wedgewood Drive, Leeds LS8 1EF. Tel: 0532 667183.

Stephen Adams, 1 Leswin Road, London N16 7NL.



Producer	RAM	Instructions	Model	Guarantee	Tests	Price
Fox	32K	Good	2	12 months	1	£24
ELR	32K	Good	2		1	£23.65
Delta	32K	V. good	1		>100	£33
Delta	32K	V. good	2		>100	£26
Fuller	32K	Poor	2		1	£24.30
ELR	32K	Average	2		1	£23.65
ELR	64K	Average	1		1	£50.65
E'	64K	Average	2		1	£46.65



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WHAT THE PRESS SAY ABOUT IT:—

IF YOU have always wanted to manage a football team, FOOTBALL MANAGER, from Addictive Games, is for you — The game is ideal for a football fanatic but the most interesting thing for us was the 3-D graphics used to create the goalmouth action — the game is a winner.
SINCLAIR USER FEBRUARY 1983

Although I'm no great football fan, I really enjoyed playing this game — excellent use is made of colour and user-defined graphics. The game is very logically put together, so that the development of strategy and tactics has a real effect. For example, one of my teams got through to the fourth round of the F.A. Cup where it was beaten by a second division side. This upset morale and meant that our promotion bid failed. Perhaps I should have given up the F.A. Cup run and held some good players back — the possibilities are endless. Brian Clough had better watch out!
ZX COMPUTING FEB/MARCH 1983

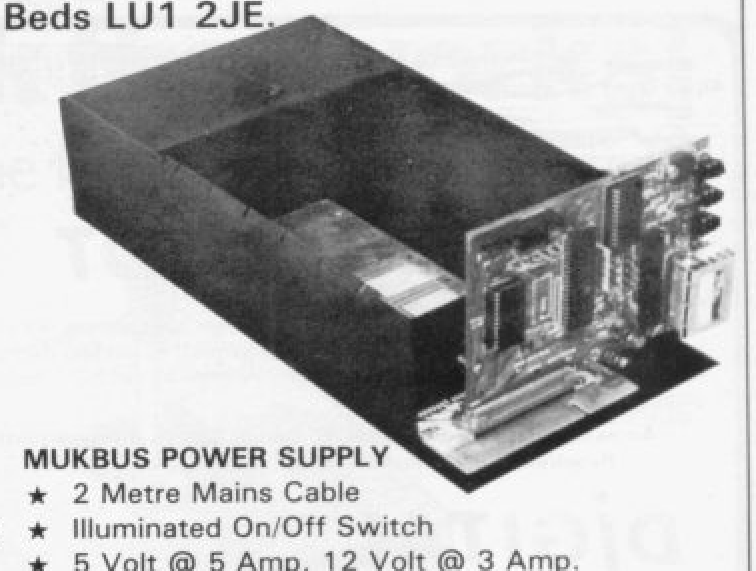
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You must fight for your life and as the sun sets, your chances of survival begin to slip away. For at night, you'll only see the gleam of their eyes!
Terror Daktil 4D – a game beyond your wildest dreams; not just 3-dimensional graphics reaching out of your Spectrum to engulf you, but also the 4th dimension of time that turns day into menacing night at an alarming rate.
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Following last month's review of assemblers John Gilbert turns his attention to their counterparts the disassemblers.

Making machine code easier to understand

THE TERM disassembler has been used in many ways by professional producers of software to describe their products and some confusion has arisen as to what a disassembler should or should not do. The strict definition of a disassembler calls for a program which will translate the numeric values of machine code into the mnemonics of assembly language. There are other packages which do all kinds of things with machine code but do not fulfil that definition. The correct term for those packages is toolkit.

The mnemonics of assembly language look like shortened versions of Basic keywords. They are used to represent the machine code numbers which computers can understand but which human programmers still find difficult to cope with in great quantities. It is much easier to understand a mnemonic such as RET, which means Return to Basic, than its machine code counterpart, which in this case is 201.

Most disassembler packages include a monitor program which allows the user to change machine code stored in RAM which has been disassembled. The disassembler makes the editing process easier, as mistakes can be spotted quickly if the programmer has a disassembly and not just a list of numbers which have to be sorted.

When computers had just been invented there was little software and languages such as Basic and Pascal did not exist. Programmers had to use programs which consisted of long lists of numbers. You can imagine the trouble if those programs did not work. Every number in the program would have to be checked to see if it was correct.

The invention of assemblers and disassemblers made things easier. You could enter code in mnemonic form using the assembler and check the code using the disassembler.

When microcomputers were invented the disassemblers used on the large mainframe computers had to be altered to work on the smaller systems, as many of the instructions which were used on mainframes could not be used on micros.

The first disassembler to appear commercially for the ZX-81 was ZXDB, from Bug-Byte. The company has built its reputation with that package along with its ZXAS assembler and the reason was because it was cheap and ran on an expensive computer.

The Bug-Byte disassembler was fairly standard in its performance. It allowed you to specify the address, or position in memory, at which you wanted the disassembly to start. The program would disassemble one line at a time and you had to press NEWLINE for the next instruction in memory to be disassembled.

The ZXDB for the ZX-81 used two fields, or areas, on the screen in which to display information. The first showed the address at which an instruction was located and the second showed the disassembly of the machine code instruction.

Other disassemblers, such as the Crystal Computing Monitor and Disassembler for the Spectrum, use three fields. The extra area on the screen is used to display the numeric machine code on which the disassembler is working. It is a good idea as you can check the mnemonics and machine code against each other to see if the disassembler is working correctly.

'The strict definition of a disassembler calls for a program which will translate the numeric values of machine code into the mnemonics of assembly language.'

If a company produces both a disassembler and an assembler it usually makes both programs compatible. That means that both programs can be put into the computer to work together and dispenses with the need to load one program to enter code and then load the next to check that the code is correct.

Having both programs in RAM at the same time will make programming in machine code quicker and easier but the amount of memory left for machine code programs will be reduced drastically. The advantages outweigh the disadvantages, though, so it is a good idea to buy a disassembler which can be used together with an assembler.

Two problems occur when a disassembler starts to produce question marks because it has not been programmed to recognise a machine code instruction. One disassembler which does not follow the Z-80 instruction set is ZXDB from Bug-Byte. The program uses 8080 code instead of Z-80. Instructions which are common on the Z-80 are named differently on 8080. For instance, LD in Z-80 is called M in 8080 code. Those two names mean different things. The LD instruction means load a register with a value, whereas M means move.

Trying to use a disassembler which does not understand the full Z-80 instruction set is like trying to use BBC Basic on a Spectrum or ZX-81. As BBC Basic is not the same as Sinclair Basic, the machine would not recognise the extra commands of the other language. As a result, when buying a disassembler, make sure that the program understands the complete Z-80 instruction set and not just a subset.

Disassemblers can serve two purposes. They can be used to view code which you have stored in RAM or they could be used to look at the ROM of the machine

With a good disassembler you could obtain a listing of the complete Sinclair ROM for either the ZX-81 or Spectrum. If you knew sufficient about machine code you might also be able to tell



how the ROM works. To investigate the ROM, or go bug-hunting in it, you need the proper kind of disassembler. Picturesque produces a monitor and disassembler package which suits the purpose. The disassembler has to provide facilities for output to a printer, as the Basic interpreter and operating system within the ROM are very lengthy.

A true analysis would have you jumping to different parts of the ROM when JP, or JumP, instructions are indicated. JumP is similar to the Basic GOTO instruction but there are many options available with that command and the disassembler will help you to spot them.

Your disassembler should be capable of handling the RST instruction as it is used many times in the ROM. It means ReStarT and the instruction provides a quick entry point into the ROM for programmers using ROM routines in their machine code programs.

The RST 10 instruction, for instance, would send the computer control to the part of the ROM which deals with the printing process. The routine sets up the machine to display one character on the screen.

Most disassembler packages on the market for both Sinclair machines are being sold mainly as an afterthought to assembler packages. The disassembler has a very important role in computing and the second-class sticker with which it has been labelled is unfair.

> 'Many programs on the market could be streamlined.'

A disassembler should be a necessity when you are writing machine code programs.

If you are to buy one, take as much time about choosing it as you would when buying an assembler. In many cases it will be the disassembler which will disappoint you with its performance and not the assembler.

For instance, the Bug-Byte ZXDB was a breakthrough when it was launched but with hindsight it is somewhat mediocre. The standard of the documentation with ZXDB was far from satisfactory; as a result, the program was difficult to use.

Disassemblers are becoming more complex all the time and there is not much which can be done to improve them. Many of the programs on the market, however, could be streamlined to fit into less RAM than is now the case.

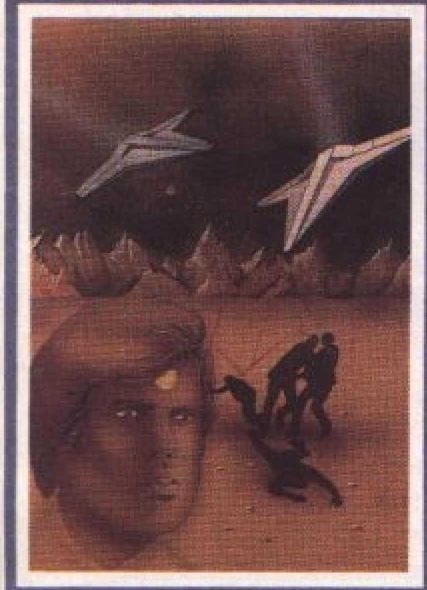
dK'tronics, Unit 2, Shire Hill Industrial Estate, Saffron Walden, Essex, CB11 3AQ.

Crystal Computing, 2 Ashton Way, East Herrington, Sunderland, SR3 3RX.

Picturesque, 6 Corkscrew Hill, West Wickham, Kent, BR4 9BB.

P.S.S. THE FUTURE MAKERS

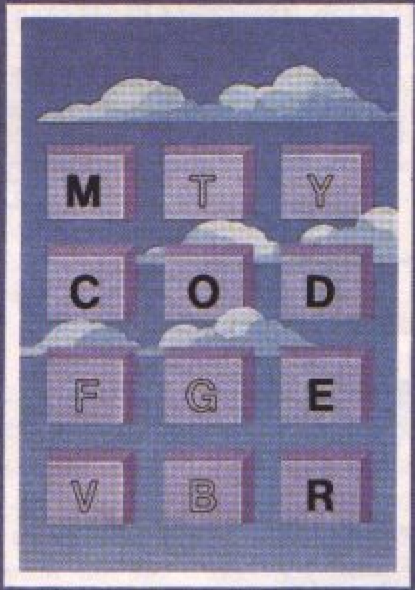
FANTASIES FOR ZX81 AND SPECTRUM



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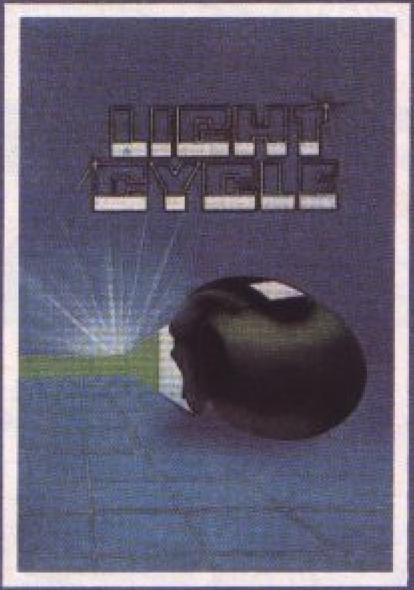
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M CODER

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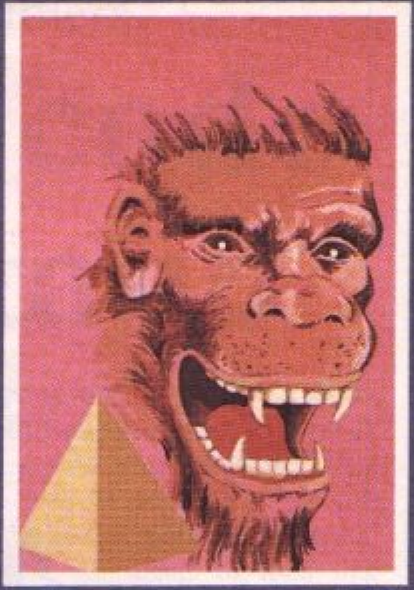
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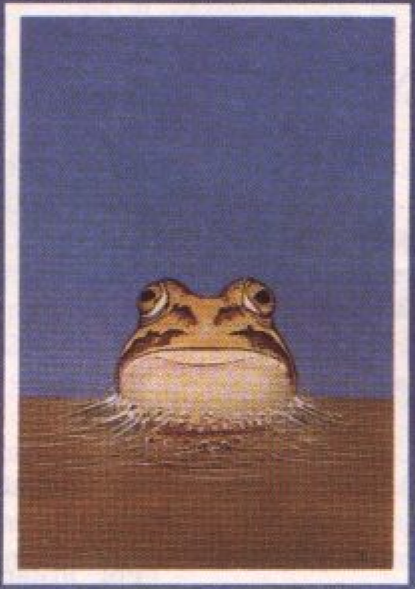
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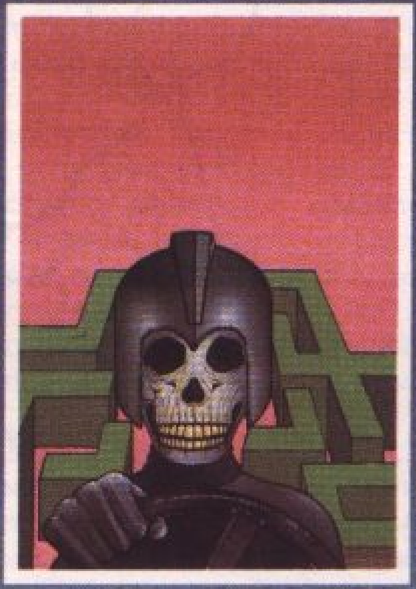
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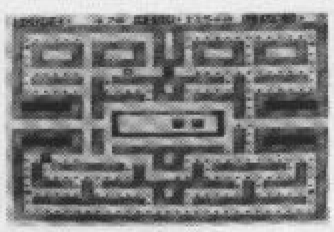
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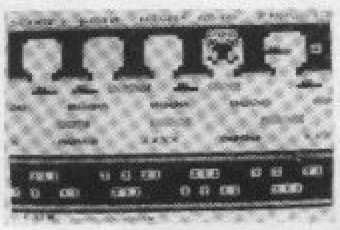
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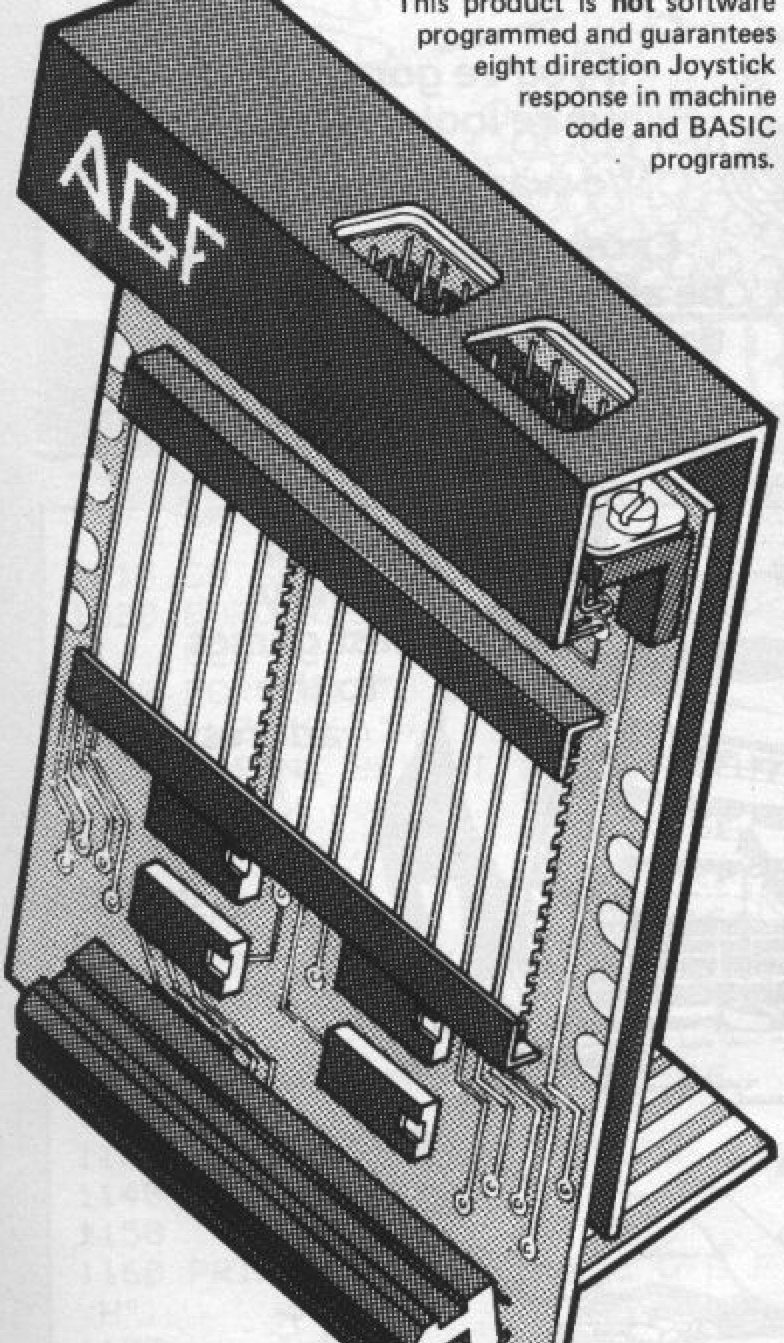
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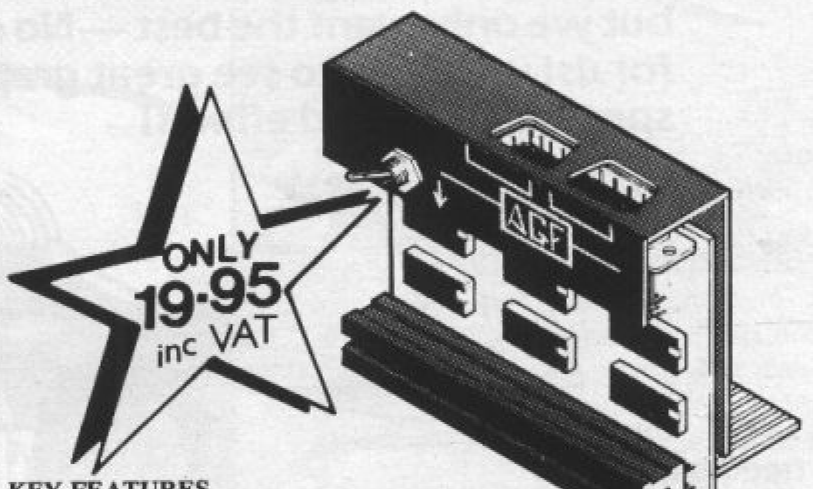
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At the time of printing it is hoped that pending releases from Bug-Byte will enjoy AGF compatibility.

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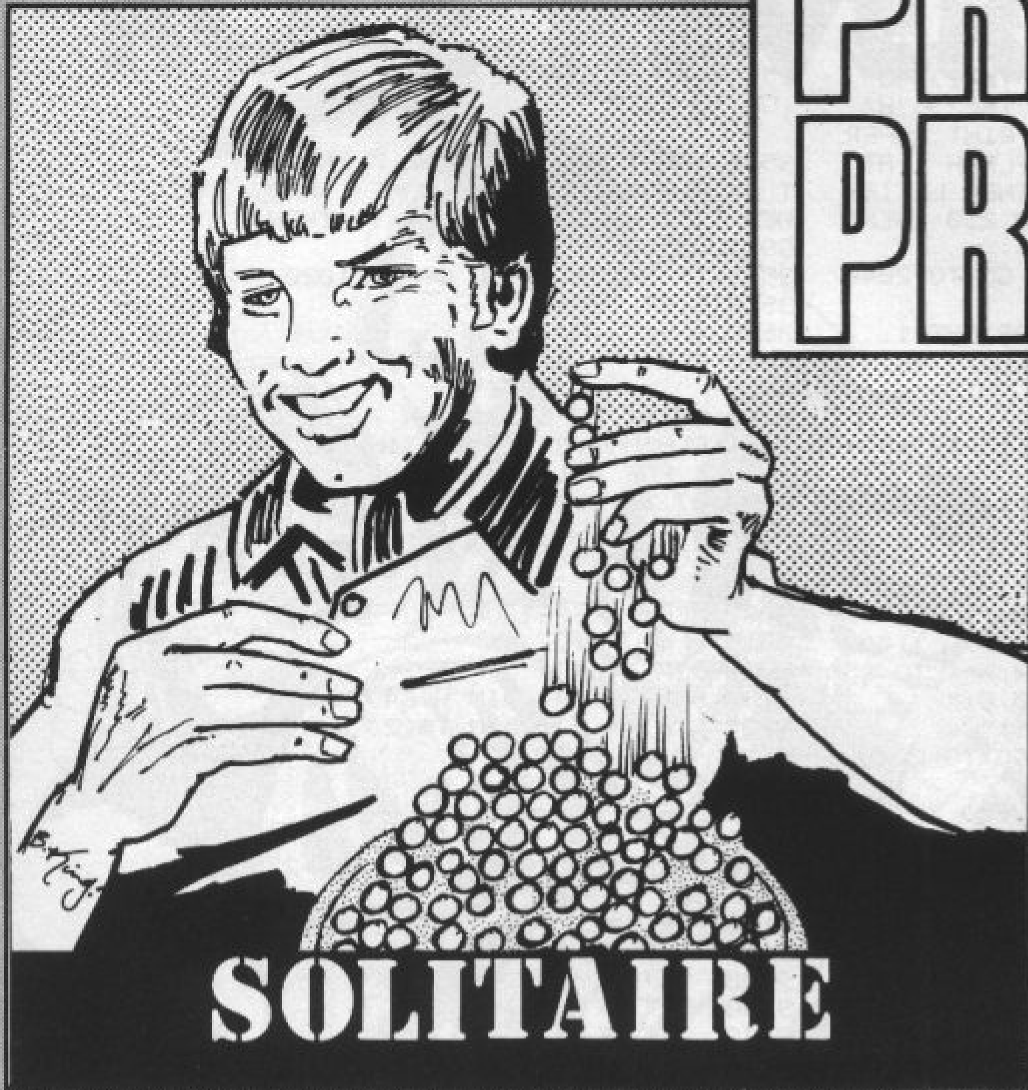
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PROGRAM PRINTOUT



KEN RYLETT of Burnage, Manchester wrote **Solitaire** for the 16K Spectrum to allow people to play the traditional game. Move one spot over the next to an empty space. The peg which has been jumped will then disappear. The aim is to finish with only one spot remaining. Moves should be entered as number, then letter.

Letters to be entered in graphics mode are underlined.

```
1015 GO SUB 9000
1020 BORDER 5: PAPER 5: INK 0:
     CLS
1030 FOR n=1 TO 64
1040  LET P(n)=1
1050  PRINT BRIGHT 1; INK 2;
      AT V(n),H(n);"a"
1060 NEXT n
1070
1080 FOR n=20 TO 148 STEP 16
1090 PLOT 60,n: DRAW 128,0
1100 NEXT n
1110
1120 FOR n=60 TO 188 STEP 16

1130 PLOT n,20: DRAW 0,128
1140 NEXT n
1150
1160 PRINT AT 2,8;"A B C D E F G
 H"
1170
1180 PRINT AT 4,6;1;AT 6,6;2;AT
8,6;3;AT 10,6;4;AT 12,6;5;AT 14,
6;6;AT 16,6;7;AT 18,6;8
1190
1200 PRINT AT V(28),H(28);" ";AT
 V(29),H(29);" ";AT V(36),H(36);
" ";AT V(37),H(37);" "
```

```
1210 LET P(28)=0: LET P(29)=0:
     LET P(36)=0: LET P(37)=0
1220 LET moves=0: LET pegs=60
1230 PRINT PAPER 1; BRIGHT 1;
INK 7;AT 0,0;"MOVES=";moves;AT 0
,25;"PEGS=";pegs;AT 4,0; PAPER 6
; INK 0; BRIGHT 1;"INPUT";AT 5,0
;"99 TO";AT 6,0;"QUIT."

1240 PRINT PAPER 6; INK 0; BRIGH
T 1;AT 9,0;"ONLY ";AT 10,0;"bc d
e";AT 11,0;"fg hi"
2020 INPUT PAPER 0; INK 7; BRIGH
T 1;"MOVE FROM ? "; LINE F$
2025 IF F$="99" THEN GO TO 3560
2030 IF F$(1)<"1" OR F$(1)>"8"
     OR F$(2)<"A" OR F$(2)>"H"
     THEN BEEP 1,1: PRINT PAPER
2; INK 7; BRIGHT 1; FLASH 1;AT
20,0; "ONLY NUMBER THEN LETTER
 e.g. 2A": FOR n=1 TO 250: NEXT
n: PRINT AT 20,0;"
                  ": GO TO 2020

                  ": GO TO 2020
2035 PRINT PAPER 1; BRIGHT 1;
INK 7; FLASH 1;AT 10,25;"FROM ";
F$
```

```
2040 INPUT PAPER 0; INK 7; BRIGH
T 1;"MOVE TO ? "; LINE T$
2045 IF T$="99" THEN GO TO 3560
2050 IF T$(1)<"1" OR T$(1)>"8"
    OR T$(2)<"A" OR T$(2)>"H"
    THEN BEEP 1,1: PRINT PAPER
2; INK 7; BRIGHT 1; FLASH 1;AT
20,0;  "ONLY NUMBER THEN LETTER
 e.g. 2A": FOR n=1 TO 250: NEXT
n: PRINT AT 20,0;"
                   ": GO TO 2040

2055 PRINT PAPER 1; BRIGHT 1;
INK 7; FLASH 1;AT 12,25;" TO  ";
T$
2060
2070 LET f=((CODE F$(1)-49)*8)+(
CODE F$(2)-64)
2080 LET t=((CODE T$(1)-49)*8)+(
CODE T$(2)-64)

2090 IF P(f)=0 OR P(t)=1 THEN
BEEP 1,1: PRINT PAPER 2; INK 7;
BRIGHT 1; FLASH 1;AT 20,6;  "
INVALID MOVE    ": FOR n=1 TO 250
: NEXT n: PRINT AT 20,6;"
            ";AT 10,25;"         ";
AT 12,25;"        ": GO TO 2020
2100
2110 LET diffv=V(f)-V(t)
2115 LET diffh=H(f)-H(t)
2120 IF diffh= 4 AND diffv=0
THEN GO TO 3100
2130 IF diffh=-4 AND diffv=0
THEN GO TO 3200
2140 IF diffv= 4 AND diffh=0
THEN GO TO 3300
2150 IF diffv=-4 AND diffh=0
THEN GO TO 3400

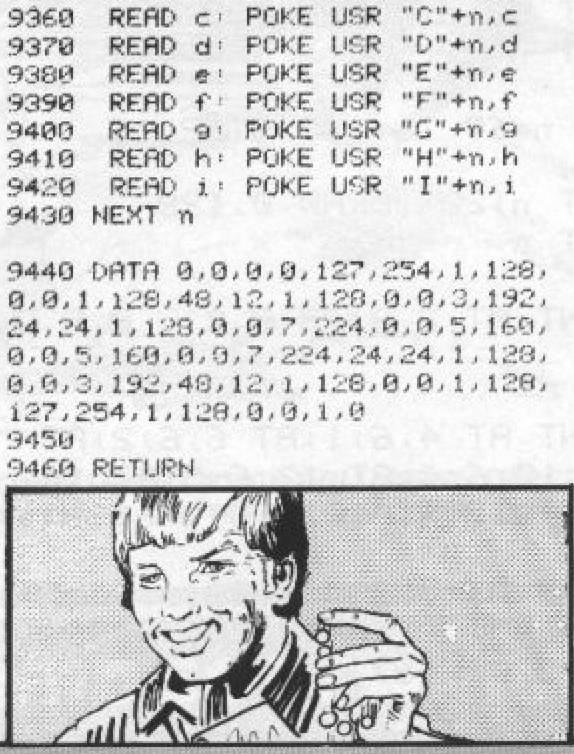
2160 BEEP 1,1: PRINT PAPER 2;
INK 7; BRIGHT 1; FLASH 1;AT 20,6
;  "    INVALID MOVE    ": FOR n=1
 TO 250: NEXT n: PRINT AT 20,6;"
                 ";AT 10,25;"
    ";AT 12,25;"         ": GO TO
 2020
3120 BEEP 1,1
3125 IF P(t+1)=0 THEN GO TO 4000
3130 PRINT INK 2;AT V(t),H(t);"a
";AT V(t),H(t+1);" ";AT V(f),H(f
);" ":
3140 LET P(t)=1: LET P(t+1)=0:
    LET P(f)=0
3150 GO TO 3500
3220 BEEP 1,1
3225 IF P(t-1)=0 THEN GO TO 4000
3230 PRINT INK 2;AT V(t),H(t);"a
";AT V(t),H(t-1);" ";AT V(f),H(f
);" ":
3240 LET P(t)=1: LET P(t-1)=0:
    LET P(f)=0
3250 GO TO 3500
3320 BEEP 1,1
3325 IF P(t+8)=0 THEN GO TO 4000
3330 PRINT INK 2;AT V(t),H(t);"a
";AT V(t+8),H(t);" ";AT V(f),H(f
);" ":
3340 LET P(t)=1: LET P(t+8)=0:
    LET P(f)=0
3350 GO TO 3500
3420 BEEP 1,1
3425 IF P(t-8)=0 THEN GO TO 4000
3430 PRINT INK 2;AT V(t),H(t);"a
";AT V(t-8),H(t);" ";AT V(f),H(f
);" ":
3440 LET P(t)=1: LET P(t-8)=0:
    LET P(f)=0
3520 LET moves=moves+1
3530 LET  pegs= pegs-1
3540 PRINT PAPER 1; INK 7; BRIGH
T 1;AT 0,31;" ";AT 0,6;moves;AT
0,30;pegs
3550 IF pegs>1 THEN PRINT AT 10,
25;"         ";AT 12,25;"        ":
 GO TO 2020

3560 INPUT PAPER 0; INK 7; BRIGH
T 1; FLASH 1;"END OF GAME , ANOT
HER ? "; LINE A$: IF A$="" THEN
GO TO 3560
3565 IF A$="Y" THEN GO TO 1020
3570 STOP
3580
4000 REM    INVALID MOVE
4010
4020 PRINT PAPER 2; INK 7; BRIGH
T 1; FLASH 1;AT 20,8;" INVALID M
OVE ": FOR n=1 TO 250: NEXT n: P
RINT AT 20,8;"              ";AT
 10,25;"         ";AT 12,25;"
    ": GO TO 2020
4030
9000 REM      SET UP
9010
9020 DIM P(64)
9030 DIM V(64): DIM H(64)
9035 DIM F$(2): DIM T$(2)

9050 FOR n=0 TO 7
9060  READ a: POKE USR "A"+n,a
9070 NEXT n
9080 DATA 60,126,255,255,255,255
,126,60
9100 FOR n=1 TO 8
9110  LET V(n)   =4
9120  LET V(n+8) =6
9130  LET V(n+16)=8
9140  LET V(n+24)=10
9150  LET V(n+32)=12
9160  LET V(n+40)=14
9170  LET V(n+48)=16
9180  LET V(n+56)=18
9190 NEXT n
9210 FOR n=1 TO 57 STEP 8
9220  LET H(n)   =8
9230  LET H(n+1)=10
9240  LET H(n+2)=12

9250  LET H(n+3)=14
9260  LET H(n+4)=16
9270  LET H(n+5)=18
9280  LET H(n+6)=20
9290  LET H(n+7)=22
9300 NEXT n
9320 POKE 23658,8
9340 FOR n=0 TO 7
9350  READ b: POKE USR "B"+n,b
9360  READ c: POKE USR "C"+n,c
9370  READ d: POKE USR "D"+n,d
9380  READ e: POKE USR "E"+n,e
9390  READ f: POKE USR "F"+n,f
9400  READ g: POKE USR "G"+n,g
9410  READ h: POKE USR "H"+n,h
9420  READ i: POKE USR "I"+n,i
9430 NEXT n

9440 DATA 0,0,0,0,127,254,1,128,
0,0,1,128,48,12,1,128,0,0,3,192,
24,24,1,128,0,0,7,224,0,0,5,160,
0,0,5,160,0,0,7,224,24,24,1,128,
0,0,3,192,48,12,1,128,0,0,1,128,
127,254,1,128,0,0,1,0
9450
9460 RETURN
```



ROLE REVERSAL



ENTHUSIASTIC Sinclair programmers are all familiar with the experience of being chased round the screen by more or less intelligent ghosts.

David Gibbs of Sutton Coldfield, West Midlands has provided an opportunity for 1K ZX-81 owners to reverse their roles and chase the ghost round the screen.

The ghost has an advantage, in that it can walk off one side of the screen and re-appear on the other. Move using the usual cursor keys.

```
W ^   1 LET C=INT (RND*32)
   5 LET A=INT (RND*21)
  10 LET Z=10
  15 LET T=0
  20 LET B=0
  40 LET B=B+(INKEY$="8")-(INKEY
$="5")
  45 LET Z=Z+(INKEY$="6")-(INKEY
$="7")
  46 LET T=T+1
  50 CLS
  60 IF Z=A AND B=C THEN GOTO 20
0
  70 PRINT AT A,C;"(i")";AT Z,B;
"(i<)"
  80 LET M=INT (RND*3)
  90 LET C=C+(M=1)-(M=2)
 100 LET A=A+(M=3)-(M=0)
 110 IF M=3 THEN LET A=A+1
 120 PRINT AT Z,B;"(i-)"
 130 IF C=32 THEN LET C=1
 140 IF C=0 THEN LET C=31
 140~IF C=0 THEN LET C=31
 150 IF A=21 THEN LET A=1
 160 IF A=0 THEN LET A=20
 180 GOTO 30
 200 PRINT AT 0,0;"YOU TOOK ";T;
" MOVES TO CATCH HIM"
 210 LET D=10
 220 FOR C=1 TO D
 230 PRINT AT Z,B;"(i<)"
 240 NEXT C
 250 LET D=D-1
 260 FOR C=1 TO D
 270 PRINT AT Z,B;"(i-)"
 280 NEXT C
 290 IF D>0 THEN GOTO 220
 300 PRINT AT Z,B+1;"BURP"
```

```
  10 FOR A=1 TO 352
  20 PRINT "(2*isP)";
  30 NEXT A
  40 PRINT AT 1,6;"(9h)";AT 2,5;
"(3*9h)";AT 3,4;"(5*9h)"
  50 PRINT AT 4,5;"     ";AT 5,5;"
  ";AT 6,5;"(9w:sP:99)"
  60 PLOT 11,34
  70 PLOT 14,34
  80 PLOT 12,32
  90 PLOT 13,32
 100 FOR B=4 TO 7
 110 PRINT AT B,2;"(9h)"
 120 NEXT B
 130 PRINT AT 7,3;"(2*9h:isP:99:
isP:3*9h)"
 140 FOR D=8 TO 14
 150 PRINT AT D,4;"(5*9h)"
 160 NEXT D
 180 PRINT AT 9,6;"(isP)";AT 11,
6;"(isP)"
 190 FOR E=14 TO 19
 200 PRINT AT E,3;"(3*9h:sP:3*9h
)"
 210 NEXT E
 220 PRINT AT 16,2;"(9h)";AT 16,
10;"(9h)";AT 17,2;"(9h)";AT 17,1
0;"(9h)"
 230 PRINT AT 20,4;"  ";AT 20,7;
"  "
 240 PRINT AT 8,10;"(9h)";AT 9,1
0;"(9h)";AT 10,10;"(9h)";AT 11,9
;"(sP:9h)"
 250 PRINT AT 1,15;"hello childr
en"
 260 FOR F=1 TO 100
 270 PRINT AT 3,2;" ";AT 3,2;"(i
sP)"
 280 NEXT F
 290 PRINT AT 3,2;" "
 300 PRINT AT 3,10;"my name is c
edric the"
 310 PRINT AT 5,18;"clown"
 320 PRINT AT 7,12;"i am going t
o ask";AT 9,12;"you some easy su
ms"
 330 PAUSE 300
 340 PRINT AT 3,10;"(21*isP)"
 350 PRINT AT 5,18;"(5*isP)"
 360 PRINT AT 7,12;"(17*isP)";AT
 9,12;"(18*isP)"
 370 PRINT AT 1,15;"(14*isP)"
 380 LET I=0
 390 LET J=0
 400 LET G=INT (RND*10)
 405 LET H=INT (RND*10)
 410 PRINT AT 1,12;G;"+";H;"="
 415 LET X=G+H
 420 INPUT K
 430 IF K=G+H THEN PRINT AT 1,18
```



PAUL ASKEW of Worksop, Nottinghamshire embellished a simple mathematics test program for children with some very professional graphics. Cedric is a clown who likes to help children with their arithmetic. He will ask simple sums involving addition and subtraction and will give the correct answer if the incorrect one is input. (16K ZX-81).

CEDRIC THE CLOWN

```
;K;"    correct"
 440 IF K<>G+H THEN PRINT AT 1,1
8;K;"     wrong";AT 3,12;"the ans
wer is";X
 450 IF K=G+H THEN LET I=I+1
 460 LET J=J+1
 475 PAUSE 300
 480 PRINT AT 1,12;"(19*isp )";AT
 3,12;"(17*isp )"
 485 IF J=10 THEN GOTO 500
 490 GOTO 400
 500 PRINT AT 1,12;"so far you h
ave";AT 3,12;" got ";I;" right"
 510 PAUSE 200
 515 PRINT AT 1,12;"(16*isp )";AT
 3,12;"(18*isp )"
 520 LET I=I
 525 LET J=J
 530 LET L=INT (RND*5)+5
 540 LET M=INT (RND*5)
 550 LET N=L-M
 560 PRINT AT 1,12;L;"-";M;"="
 570 INPUT O
 580 IF O=L-M THEN PRINT AT 1,18
;O;"    correct"
 590 IF O<>L-M THEN PRINT AT 1,1
8;O;"     wrong";AT 3,12;"the ans
wer is";N
 600 PAUSE 200
 610 PRINT AT 1,12;"(17*isp )";AT
 3,12;"(19*isp )"
 620 IF O=L-M THEN LET I=I+1
 625 LET J=J+1
 630 IF J=20 THEN GOTO 650
 640 GOTO 530
 650 IF I>=0 AND I<5 THEN PRINT
AT 1,12;"ask your dad to help";A
T 3,12;"you with your maths"
 660 IF I>=5 AND I<10 THEN PRINT
 AT 1,12;"you need to study more
"
 670 IF I>=10 AND I<15 THEN PRIN
T AT 1,12;"well done"
 680 IF I>=15 AND I<=19 THEN PRI
NT AT 1,12;"very well done"
 690 IF I=20 THEN PRINT AT 1,12;
"excellent"
 700 PRINT AT 5,12;"would you li
ke";AT 7,12;"another go (y\n)"
 710 INPUT A$
 720 IF A$="Y" THEN GOTO 10
 730 IF A$="N" THEN GOTO 740
 740 PRINT AT 1,12;"(16*isp )";AT
 3,12;"(17*isp )";AT 5,12;"(19*is
p )";AT 7,12;"(20*isp )"
 745 PRINT AT 1,12;"goodbye"
 750 FOR Z=1 TO 100
 760 PRINT AT 3,2;" ";AT 3,2;"(i
sp )"
 770 NEXT Z
 780 PRINT AT 20,15;"end of pogr
am"
```

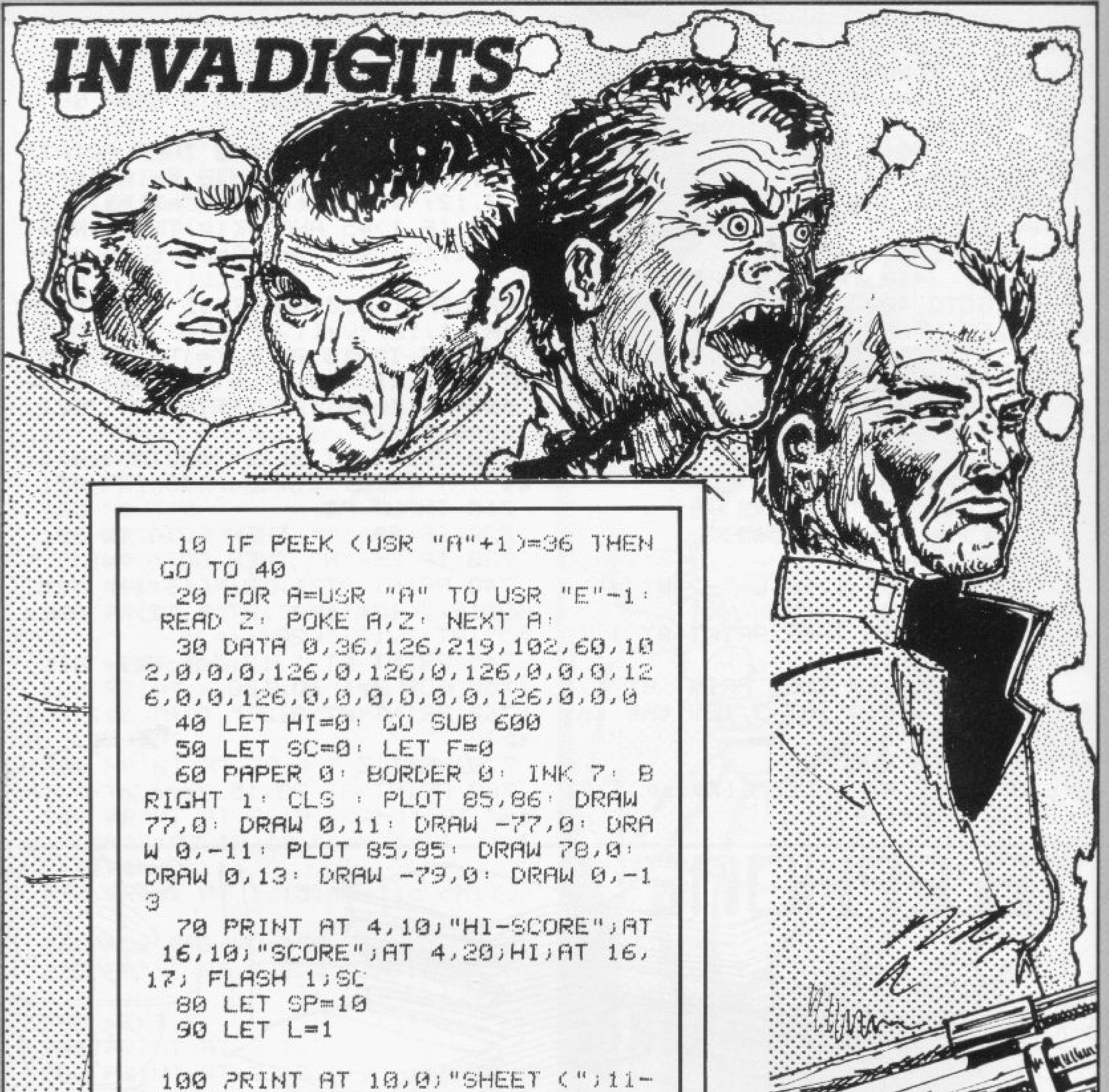
TELEPHONE



PHILIP MEADE of Chippenham, Wiltshire wrote this short and simple **Telephone** routine to simulate a telephone ringing on the Spectrum. The sound could be inserted in a game or used, as it was here, to infuriate others in the office.

```
  10 LET a=10: LET b=0.015
  20 FOR c=0 TO 10: BEEP b,a: NE
XT c
  30 PAUSE 10
  40 FOR c=0 TO 10: BEEP b,a: NE
XT c
  50 PAUSE 60
  60 GO TO 10
```

INVADIGITS



```
 10 IF PEEK (USR "A"+1)=36 THEN
 GO TO 40
  20 FOR A=USR "A" TO USR "E"-1:
 READ Z: POKE A,Z: NEXT A:
  30 DATA 0,36,126,219,102,60,10
2,0,0,0,126,0,126,0,126,0,0,0,12
6,0,0,126,0,0,0,0,0,0,126,0,0,0
  40 LET HI=0: GO SUB 600
  50 LET SC=0: LET F=0
  60 PAPER 0: BORDER 0: INK 7: B
RIGHT 1: CLS : PLOT 85,86: DRAW
77,0: DRAW 0,11: DRAW -77,0: DRA
W 0,-11: PLOT 85,85: DRAW 78,0:
DRAW 0,13: DRAW -79,0: DRAW 0,-1
3
  70 PRINT AT 4,10;"HI-SCORE";AT
 16,10;"SCORE";AT 4,20;HI;AT 16,
17; FLASH 1;SC
  80 LET SP=10
  90 LET L=1

 100 PRINT AT 10,0;"SHEET (";11-
SP;")"
 110 LET HT=0
 120 LET I=0
 130 LET SH=0
 140 LET A$=""
 150 LET N=0
 160 PRINT AT 10,11;"0 ";CHR$ (L
+144);"      "
 170 LET G=HT
 180 IF L=1 THEN FOR G=0 TO 16
 190 PRINT AT 10,20-LEN A$-F;A$
 200 FOR B=1 TO SP
 210 PAUSE 5
 220 LET N=N+(INKEY$="1"): IF N=
11 THEN LET N=0
 230 PRINT AT 10,11;(STR$ N AND
N<10);("a" AND N=10)
 240 IF INKEY$<>"0" THEN GO TO 3
```

Continued next page

MATCH THE FIGURE on the left with that on the right. Advance the figure on the left by pressing "1" and press "0" when the figures are identical. Clear a sheet of 16 figures for an increase in speed and a bonus. Clear eight sheets for another bonus and a slightly more difficult game.

The sooner you match your numbers, the higher your score. Match a space invader to gain an extra 300 points. The game ends when three lives are lost or more than 30 shots are fired in one sheet.

Peter Bernstein of Northwood, Middlesex, who wrote the game for the 16K Spectrum, says his highest score is 25,490.

Continued from page 62

```
60
 250 LET SH=SH+1: IF SH=30 THEN
GO TO 430

 260 FOR A=1 TO LEN A$: IF A$(A)
=STR$ N OR (A$(A)="a" AND N=10)
THEN GO TO 290
 270 NEXT a
 280 BEEP .08,-10: GO TO 360
 290 LET SC=SC+(6-LEN A$+A-F)*10
*(F+1): IF N<>10 THEN LET I=I+N:
 GO TO 310
 300 LET SC=SC+300
 310 LET HT=HT+1
 320 LET A$=A$( TO A-1)+A$(A+1 T
O )
 330 IF N<>10 THEN BEEP .09,20:
GO TO 350
 340 FOR W=45 TO 20 STEP -3: BEE
P .01,W: NEXT W
 350 PRINT AT 10,14;"       ";AT
10,20-LEN A$-F;A$;AT 16,17; FLAS
H 1;SC

 360 IF A$="       "( TO LEN A$)
AND G=16 THEN GO TO 520
 370 NEXT B
 380 LET B$=STR$ (INT (RND*10)):
 IF I/10=INT (I/10) AND I<>0 THE
N LET B$="a": LET I=0
 390 IF G=16 THEN LET G=15: LET
B$=" "
 400 LET A$=A$+B$
 410 IF LEN A$<7-F THEN NEXT G
 420 IF L<3 THEN PRINT AT 10,11;
 FLASH 1; BRIGHT 1;"(9*96)": BEE
P 2,-20: LET L=L+1: GO TO 140
 430 PRINT AT 10,11; BRIGHT 1; F
LASH 1;"GAME OVER"
 440 FOR A=0 TO -40 STEP -1: BEE
P .05,A+(RND*3-1): NEXT A
 450 IF HI<SC THEN LET HI=SC
 460 PRINT AT 20,7;"ANOTHER GO ?
(Y/N)"
 470 PAUSE 0: LET I$=INKEY$

 480 IF I$="Y" OR I$="y" THEN BE
EP .5,10: GO SUB 620: GO TO 50
 490 IF I$<>"N" AND I$<>"n" THEN
 GO TO 470
 500 STOP
 510 NEXT G
 520 PRINT AT 10,11; FLASH 1;"(9
*i98)"
 530 FOR T=1 TO 3: BEEP .1,10: B
EEP .05,20: BEEP .1,15: BEEP .1,
10: NEXT T
 540 LET SP=SP-1: IF SP>2 THEN G
O TO 90
 550 LET SP=11
 560 PRINT AT 10,11; FLASH 1;"
BONUS  "
 570 FOR A=-20 TO 19: LET SC=SC+
10: PRINT AT 16,17;SC: BEEP .1,A
: NEXT A
 580 LET F=F=0
 590 GO TO 80

 600 PAPER 7: INK 0: BORDER 7: B
RIGHT 0: CLS
 610 PRINT AT 5,10;"INVADIGITS";
TAB 10;"(10*93)";AT 10,6;"""1""
 ADVANCE NUMBER";AT 14,6;"""0""
 FIRE"
 620 PRINT AT 20,4; FLASH 1; BRI
GHT 1;"PRESS ANY KEY TO START"
 630 GO TO 630+(INKEY$<>"")
 640 CLS
 650 RETURN
```





STORM.

```
   1 REM (MACHINE CODE-188 CH
   6 PRINT "WHEN THE LAST PAIR H
AS BEEN ENTERED ENTER (S)"
  10 LET A$=""
  20 LET X=16520
  30 IF A$="" THEN INPUT A$
  40 IF A$="S" THEN STOP
  50 SCROLL
  60 PRINT A$( TO 2),X
  70 POKE X,16*CODE A$+CODE A$(2
)-476
  80 LET A$=A$(3 TO )
  90 LET X=X+1
 100 GOTO 30
  10 PRINT AT 0,0;"00000000 VVV
storm"
  20 POKE 16418,0
  30 FOR N=1 TO 23
  40 PRINT "
                "
  50 NEXT N
  60 POKE 16418,2
  70 PRINT AT 10,3;"ENTER LEVEL
OF DIFFICULTY"
  80 INPUT A
  90 IF A>255 THEN GOTO 80
 100 POKE 16654,A
 105 PRINT AT 10,3;"         ENTER
SPEED            "
 110 INPUT A
 120 IF A>255 THEN GOTO 110
 130 POKE 16690,A
 135 PRINT AT 10,3;"
                "
 136 FOR N=1 TO 50
 137 IF INKEY$<>"" THEN GOTO 140
 138 NEXT N
 140 RAND USR 16520
 150 PRINT AT 10,10;"GAME OVER";
 AT 20,9;"PRESS A KEY"
 160 IF INKEY$<>"" THEN GOTO 160
 170 IF INKEY$="" THEN GOTO 170
 180 RUN
 190 SAVE "STORm"
 200 RUN
```



YOU ARE situated at the top of the screen. Avoid the storm of black squares rushing at you by moving left and right with keys "1" and "0". At the start of the game you are asked to enter your speed and difficulty level. Entering "5" for both produces a reasonably fast game.

C Hornby of Hassocks, Sussex speeded the game by writing part of it in machine code. Enter the short initial program. RUN it, then enter the series of numbers two at a time, working from left to right, entering "S" to end the series. RUN the program again, delete all lines except line one, and then enter the main program. (16K ZX-81).

PETE THE PARTY GOER



YOU PLAY the part of cheerful Pete who, to bring some happiness into the lives of his fellow party-goers, is bouncing balloons on his tennis racquet. The others at the party have threatened that if Pete fails and misses his balloons they will eat him. Prolong Pete's life by moving him left and right with keys "1" and "0".

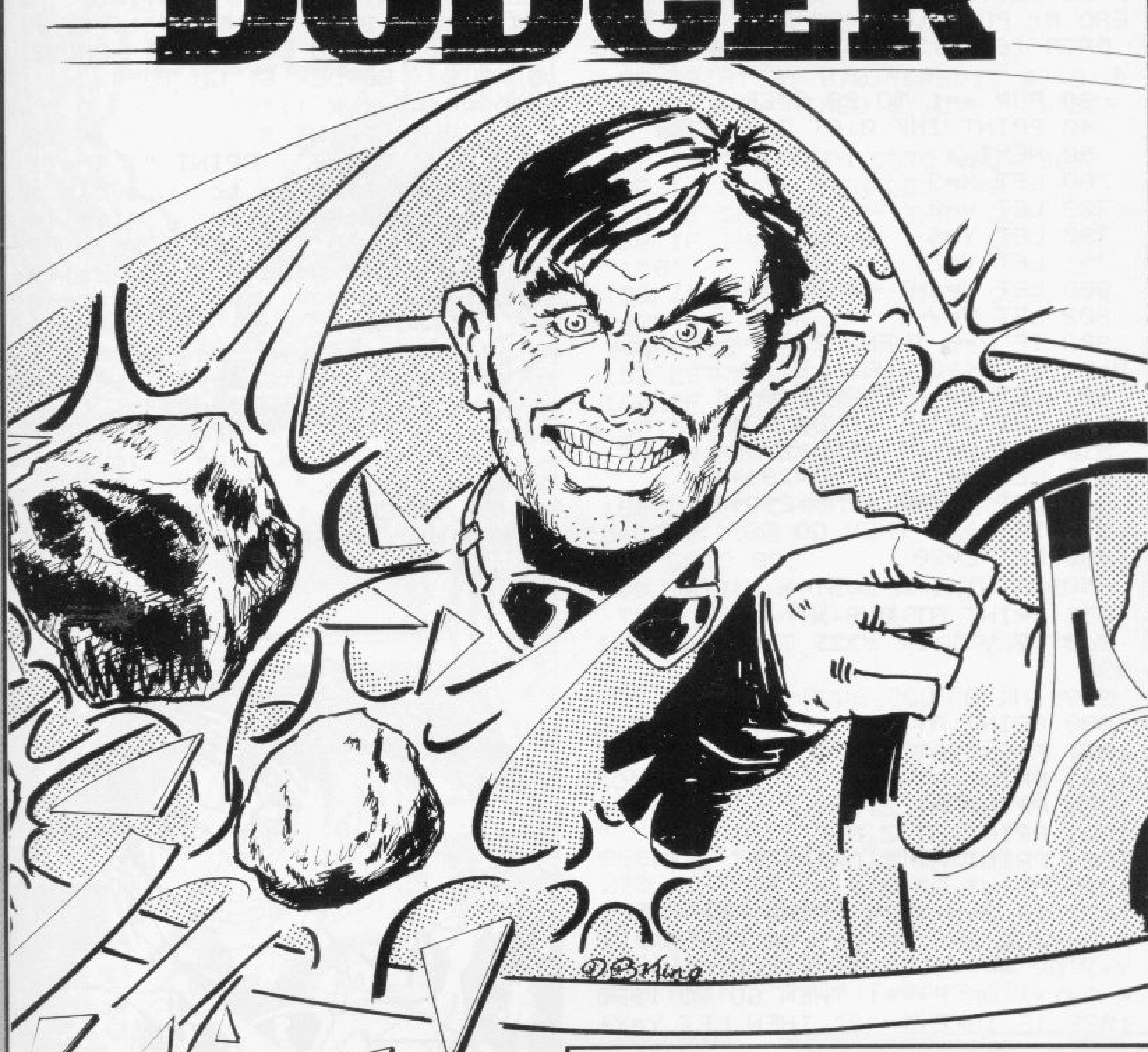
Pete the Party-goer was written for the 16K Spectrum by J Smith of Coulsdon, Surrey.

```
   1 REM xxxxxxxxxxxxxx
   2 CLS : LET n$="spectrum"
   3 LET hi=0
   4 GO SUB 1000
   5 LET sc=0
   6 LET c=1: LET li=3
   7 PRINT AT 11,0;"Instructions
(y/n)"
   8 PAUSE 0
  10 IF INKEY$="y" THEN GO SUB 2
020
  11 DEF FN h( )=2*(SGN ((PEEK (j
+2345))-(PEEK (j+8976))))
  20 PRINT AT 21,0;"level 1-3?":
 PAUSE 0: LET l$=INKEY$
  21 IF l$>"3" OR l$<"1" THEN BE
EP .5,-40: GO TO 20
  23 CLS
  24 PRINT TAB 6;"SCORE:";sc;TAB
 16;"HIGH:";hi;TAB 25;"LIVES:";l
i
  25 LET l=VAL l$
  40 LET i=1
  50 DIM a(l+1,2)
  60 FOR n=1 TO l+1
  70 LET a(n,1)=INT (RND*5)+6
  80 LET a(n,2)=1
  85 IF RND>.6 THEN LET a(n,2)=a
(n,2)/2
  90 PRINT AT a(n,1),n*2; INK n;
"O"
 100 NEXT n
 105 PLOT 0,23: DRAW 131,0: GO S
UB 3020
 110 LET x=18: LET y=8: LET sc=0
 120 FOR n=1 TO l+1
 121 BEEP .0001,60
 130 PRINT AT a(n,1),n*2;" "
 140 LET a(n,1)=a(n,1)+a(n,2)
 150 IF a(n,1)<6+(INT (RND*4)) T
HEN LET a(n,2)=-a(n,2)
 160 IF a(n,1)>=19+a(n,2) THEN L
ET li=li-1: BEEP .1,-30: LET a(n
,1)=6: GO SUB 3000: PRINT AT 0,3
1;li: IF li=0 THEN GO TO 250
 170 PRINT AT a(n,1),n*2; INK n;
"O"
 180 NEXT n
 190 IF c=1 THEN IF sc=16 THEN G
O SUB 2000
 200 PRINT AT x-2,y+1;" ";AT x-1
,y+1;" ";AT x,y;"  "
 210 LET y=y+(INKEY$="0" AND y<1
5)-(INKEY$="1" AND y>0)
 220 PRINT AT x-2,y+1; INK 2;"d"
; INK 0;AT x-1,y+1;"b";AT x,y;"c
a"
 225 IF INKEY$="h" THEN PAUSE 30
```

```
: PAUSE 0
 230 IF SCREEN$ (x-1,y)="O" THEN
 LET a(y/2,2)=-a(y/2,2): LET sc=
sc+1: BEEP .01,30: PRINT AT 0,5;
"SCORE:";sc;TAB 16;"HIGH:";hi
 240 GO TO 120
 251 LET p$=CHR$ 22+CHR$ 0+CHR$
0+"tough luck you ran out of liv
es."+CHR$ 13+"score:"+STR$ sc
 252 GO SUB 270
 253 LET p$=CHR$ 22+CHR$ 3+CHR$
0+"CHOMP, MUNCH, SHLURP"+CHR$ 13
+"DELICIOUS!!!!"
 254 GO SUB 270: FOR n=24 TO 1 S
TEP -1: PLOT y*8+8,23+n: DRAW IN
VERSE 1;24,0: NEXT n: PRINT AT x
,y; OVER 1;"c": PLOT y*8,39: DRA
W 16,0
 255 IF sc>hi THEN LET hi=sc: LE
T p$=CHR$ 22+CHR$ 9+CHR$ 0+"NEW
HIGH SCORE!!!!!": GO SUB 270: FO
R e=1 TO 5: RANDOMIZE USR 23760:
 NEXT e: BORDER 7: INPUT "your n
ame please ";n$
 260 LET p$=CHR$ 22+CHR$ 11+CHR$
0+"high score is "+STR$ hi+" by
"+n$
 261 GO SUB 270
 262 IF SCREEN$ (9,0)="N" THEN P
RINT AT 16,0;"Save high score?":
 PAUSE 0: LET o$=INKEY$: IF o$="
y" THEN SAVE "pete" LINE 4
 269 GO TO 320
 270 FOR n=1 TO LEN p$
 280 PRINT p$(n);
 290 BEEP .01,60
 300 NEXT n
 310 RETURN
 320 PRINT AT 13,0;"Again? "
 321 PAUSE 30: PAUSE 0: LET o$=I
NKEY$
 322 CLS
 330 GO TO (340 AND NOT o$="y")+
(5 AND o$="y")
 340 PRINT "O.K"
 999 GO TO 9999
1000 DATA 24,60,90,154,24,24,36,
36
1001 DATA 36,60,66,82,194,114,36
,24
1002 DATA 0,0,0,31,28,0,0,0
1003 DATA 0,0,0,0,102,60,60,60
1004 RESTORE 1000
1010 FOR n=0 TO 31: READ a: POKE
 USR "a"+n,a: NEXT n
1011 DATA 6,255,197,6,255,120,21
1,254,16,251,193,16,245,201
1012 FOR n=0 TO 13: READ a: POKE
 23760+n,a: NEXT n
1020 RETURN
2000 FOR q=1 TO l+1: LET a(q,2)=
1*SGN a(q,2): BEEP .1,q*2: NEXT
q
2005 LET c=0
2010 RETURN
2020 REM ££instructions££
2025 CLS
2030 PRINT 'TAB 6.5;"Pete the Pa
rty-goer"'''"You must move Pete:
 "''"around using ""1"" to go le
ft"'"and ""0"" to go right"
2040 PRINT '"Pete's job is to bo
unce the"'"balloons (O) with his
 tennis"'"raquet (c)."
2050 PRINT '"His fellow party-go
ers have said"'"""If you fail, W
e will eat you"""
2060 PRINT '"The food at this pa
rty is so bad"'"that they will p
robably carry"'"out their threat
"
2070 PRINT AT 3,19; INK 2;"d"; I
NK 0;AT 4,19;"b";AT 5,18;"ca"
2080 RETURN
3000 PLOT 0,23: DRAW 131,0
3010 PRINT AT x-2,y+1; INK 2;"d"
; INK 0;AT x-1,y+1;"b";AT x,y;"c
a"
3020 PLOT 0,5: DRAW 131,0
3030 PLOT 0,5
3040 FOR j=0 TO 130 STEP 6
3050 DRAW 3,13+FN h(): DRAW 3,-1
3-FN h()
3060 NEXT j
3065 PLOT 0,5: DRAW 0,18: PLOT 1
32,5: DRAW 0,18
3070 RETURN
4000 FOR h=0 TO 80 STEP 3
4010 PLOT h,150
4020 DRAW INK (RND*7)+1;20,0,RND
*PI
4030 NEXT h
```



DODGER



AVOID the missiles flying towards you by using cursor keys "5" and "8". Each time you avoid a batch you descend another level and the game becomes more difficult.

Adam Dangoor of Richmond, Surrey wrote **Dodger** for the 16K Spectrum.

```
   2 BORDER 6: PAPER 6: INK 1: C
LS
   3 LET U=0
   4 GO SUB 2000
   5 BORDER 3: PAPER 6: CLS
   6 FOR J=0 TO 21
   7 PRINT INK 2;AT J,0;"*";AT J
,31;"*"
   8 NEXT J
   9 PRINT AT 0,15;"HIGH SCORE:"
;U
  10 PRINT AT 0,2;"LEVEL:"
  15 RESTORE 15: FOR Z=0 TO 7: R
EAD A: POKE USR "A"+Z,A: NEXT Z:
 DATA 15,63,127,51,63,24,16,56
  17 RESTORE 17: FOR Z=0 TO 7: R
```

```
EAD A: POKE USR "B"+Z,A: NEXT Z:
 DATA 240,252,254,204,252,24,8,2
8
  20 RESTORE 20: FOR Z=0 TO 7: R
EAD A: POKE USR "C"+Z,A: NEXT Z:
 DATA 16,16,56,56,124,124,124,25
4
  30 FOR a=1 TO 29 STEP 2
  40 PRINT INK 0;AT 21,a;"■■"
  50 NEXT a
 780 LET X=3
 789 LET H=0
 790 LET Y=6
 791 LET V=2
 800 LET W=INT (RND*29)+1
 802 LET V=V-1
 803 IF V=0 THEN LET X=X+1: LET
V=3: IF X<10 THEN LET V=1
 808 LET M=INT (RND*29)+1
 809 LET N=INT (RND*29)+1
 810 LET Q=INT (RND*29)+1
 812 LET D=INT (RND*29)+1
 815 LET F=INT (RND*29)+1
 817 IF x>20 THEN GO TO 1990
 830 LET Z=20
 850 PRINT INK 1;AT X,Y;"AB"
 855 PRINT AT 0,8;X
 860 IF Y<1 OR Y>29 THEN GO TO 1
990
 999 INK 0
1000 PRINT AT Z,Q;"C";AT Z,W;"C"
1001 PRINT AT Z,M;"C";AT Z,N;"C"
1002 PRINT AT Z,D;"C";AT Z,F;"C"
1020 PRINT AT Z,Q;" ";AT Z,W;" "
1023 PRINT AT Z,M;" ";AT Z,N;" "
1024 PRINT AT Z,D;" ";AT Z,F;" "
1025 PRINT AT X,Y;"  "
1027 IF Z=X THEN IF W=Y OR M=Y O
R N=Y OR Q=Y OR D=Y OR F=Y OR W=
Y+1 OR M=Y+1 OR N=Y+1 OR Q=Y+1 O
R D=Y+1 OR F=Y+1 THEN GO TO 1990
1028 IF INKEY$="8" THEN LET Y=Y+
1
1029 IF INKEY$="5" THEN LET Y=Y-
1
1030 LET Z=Z-1: IF Z<X THEN GO T
O 800
1040 GO TO 850
1992 IF X>U THEN LET U=X
1994 IF X<16 THEN LET R$="SPACE
CADET"
1995 IF X=15 OR X=14 THEN LET R$
="SOLDIER"
1996 IF X=17 OR X=16 THEN LET R$
="LIEUTENANT"
1997 IF X=19 OR x=18 THEN LET R$
="COMMANDER"
1998 IF X=20 OR X=21 THEN LET R$
="SPACE ADMIRAL"
```

```
1999 FOR I=-10 TO 40: BEEP .01,I
: NEXT I: BORDER 2: PRINT AT 6,5
; INVERSE 1;"YOU HAVE BEEN DESTR
OYED": PRINT AT 10,6;"RATING:  "
;R$: PAUSE 300: PRINT AT 16,3;"P
RESS ANY KEY TO CONTINUE": PAUSE
 0: CLS : BORDER 6: GO TO 4
2000 PRINT INK 1;"           D O
D G E R ": PRINT "          @ 19
83 A.D.": PRINT : PRINT "  The i
dea of the game is to    avoid b
eing hit by the alien    missile
s using the '5' and '8'  keys.Af
ter every few waves of   missile
s that you dodge your    space-s
hip will decend one      charact
er square until you reachthe ali
en bases.You must keep   away fr
om the stars at the edge of the
screen as they are mines.When yo
u have finished a game   you wil
l get a rating.": PRINT : PRINT
TAB 6; INVERSE 1;"PRESS ANY KEY
TO BEGIN": PAUSE 0: RETURN
```





MINER

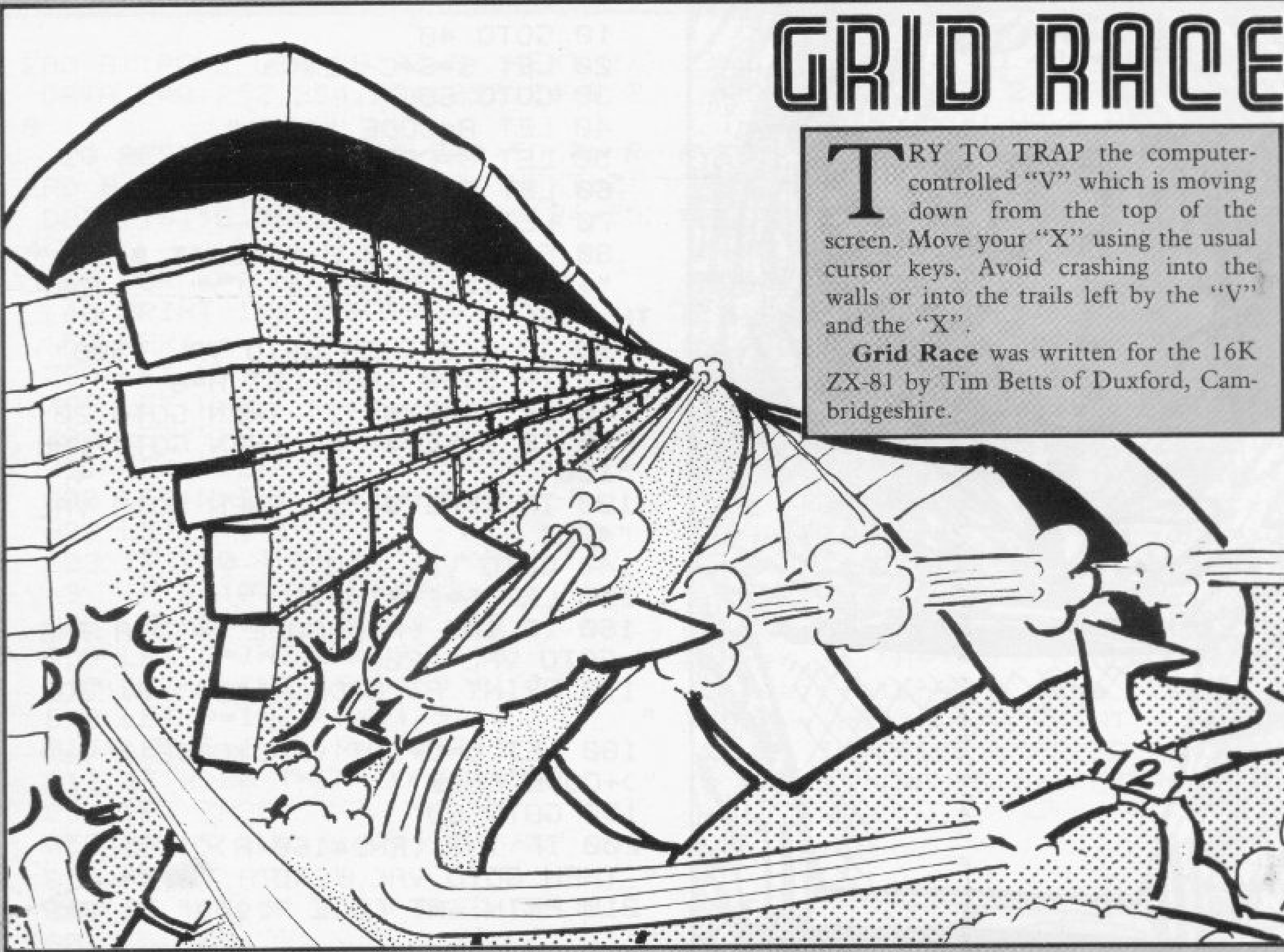
```
  10 GOTO 40
  20 LET S=S+C-(E*4)
  30 GOTO 60
  40 LET A=CODE "(92)"
  50 LET S=CODE "COS "
  60 LET E=PI-PI
  70 LET C=E
  80 PRINT AT 0,0;"CREDIT $";S;"
  ";AT 1,0;"MINED $";C;"    ","DEP
TH ";E;"   "
  90 IF S<0 THEN GOTO VAL "300"
 100 IF E>20 THEN LET A=8
 110 IF INKEY$="7" THEN GOTO 20
 120 IF INKEY$="6" THEN GOTO VAL
 "150"
 130 IF INKEY$="S" THEN GOTO VAL
 "400"
 140 GOTO VAL "90"
 150 LET E=E+PI/PI
 160 IF INT (RND*CODE "=")>A THE
N GOTO VAL "200"
 170 PRINT AT CODE "(95)",0;"GOL
"
 180 LET C=C+INT (RND*CODE "(9s)
")+CODE "(9s)"
 190 GOTO 80
 200 IF INT (RND*160/A)<>CODE "?
" THEN GOTO VAL "240"
 210 PRINT AT CODE "(95)",0;"EXP
"
 220 LET C=C-CODE "COS "
 230 GOTO 80
 240 IF INT (RND*10)<>5 THEN GOT
O VAL "160"
 250 PRINT AT CODE "(95)",0;"COA
"
 260 LET C=C+INT (RND*5)+1
 270 GOTO 80
 300 PRINT "BANKRUPT"
 310 STOP
 400 IF E<>0 THEN GOTO VAL "90"
 410 PRINT "PROFIT=$";S-200
```

YOU START with $200 in the bank and your aim is to make as much profit as possible from your mine. It costs you $4 to dig one metre and each time you return to the surface your funds are altered to take account of your profit and expenditure.

You may find coal (coa) or gold (gol), or you may be unlucky and be involved in an explosion, which will cost you $200. Key 6 moves you down the mine and key 7 returns you to the surface.

Mark Evans of Welling, Kent wrote **Miner** for the 1K ZX-81.

GRID RACE



TRY TO TRAP the computer-controlled "V" which is moving down from the top of the screen. Move your "X" using the usual cursor keys. Avoid crashing into the walls or into the trails left by the "V" and the "X".

Grid Race was written for the 16K ZX-81 by Tim Betts of Duxford, Cambridgeshire.

```
   1 REM "GRID RACE"
  10 PRINT "(32*isP)"
  20 FOR A=1 TO 20
  30 PRINT "(isP:30*i+:isP)"
  40 NEXT A
  50 PRINT "(32*isP)"
  60 LET X=19
  65 LET DIR=3
  70 LET Y=15
  80 LET A=2
  90 LET B=INT ((RND*20)+5)
  91 LET C=A
  92 LET D=B
  93 LET YD=1
 100 PRINT AT X,Y;"X"
 101 LET A=C
 102 LET B=D
 110 PRINT AT A,B;"V"
 118 PRINT AT A,B;" "
 119 PRINT AT X,Y;" "
 120 IF INKEY$="7" THEN LET YD=1
 130 IF INKEY$="6" THEN LET YD=3
 140 IF INKEY$="5" THEN LET YD=4
 150 IF INKEY$="8" THEN LET YD=2
 151 IF YD=1 THEN LET X=X-1
 152 IF YD=3 THEN LET X=X+1
 153 IF YD=4 THEN LET Y=Y-1
 154 IF YD=2 THEN LET Y=Y+1
 159 PRINT AT X,Y;
 160 LET Z=PEEK (PEEK 16398+256*
PEEK 16399)
 170 IF Z=128 OR Z=0 THEN GOTO 9
000
 180 GOTO 2990
 190 GOTO 100
2000 LET DIR=INT ((RND*4)+1)
2001 LET C=A
2002 LET D=B
2010 GOTO 3000
2990 LET L=0
3000 IF DIR=1 THEN LET C=C-1
3010 IF DIR=2 THEN LET D=D+1
3020 IF DIR=3 THEN LET C=C+1
3030 IF DIR=4 THEN LET D=D-1
3035 PRINT AT C,D;
3040 LET Z=PEEK (PEEK 16398+256*
PEEK 16399)
3050 IF Z=0 OR Z=128 THEN GOTO 3
070
3060 GOTO 190
3070 LET L=L+1
3075 IF L=5 THEN GOTO 3090
3080 GOTO 2000
3090 PRINT AT 1,1;"YOU WIN"
3100 STOP
9000 PRINT AT 1,1;"YOU LOOSE"
```

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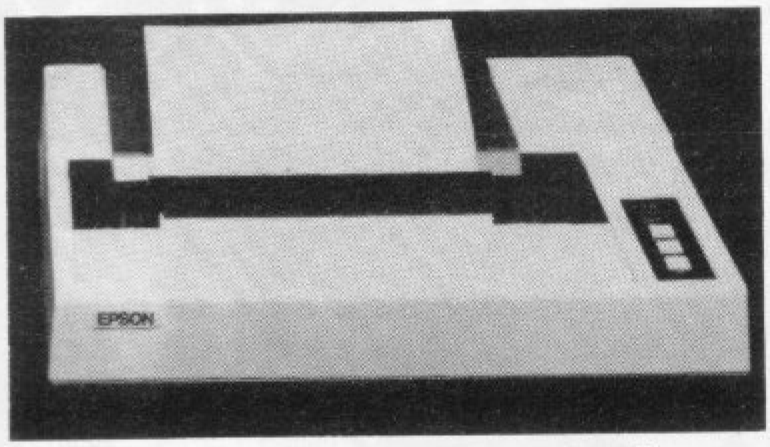
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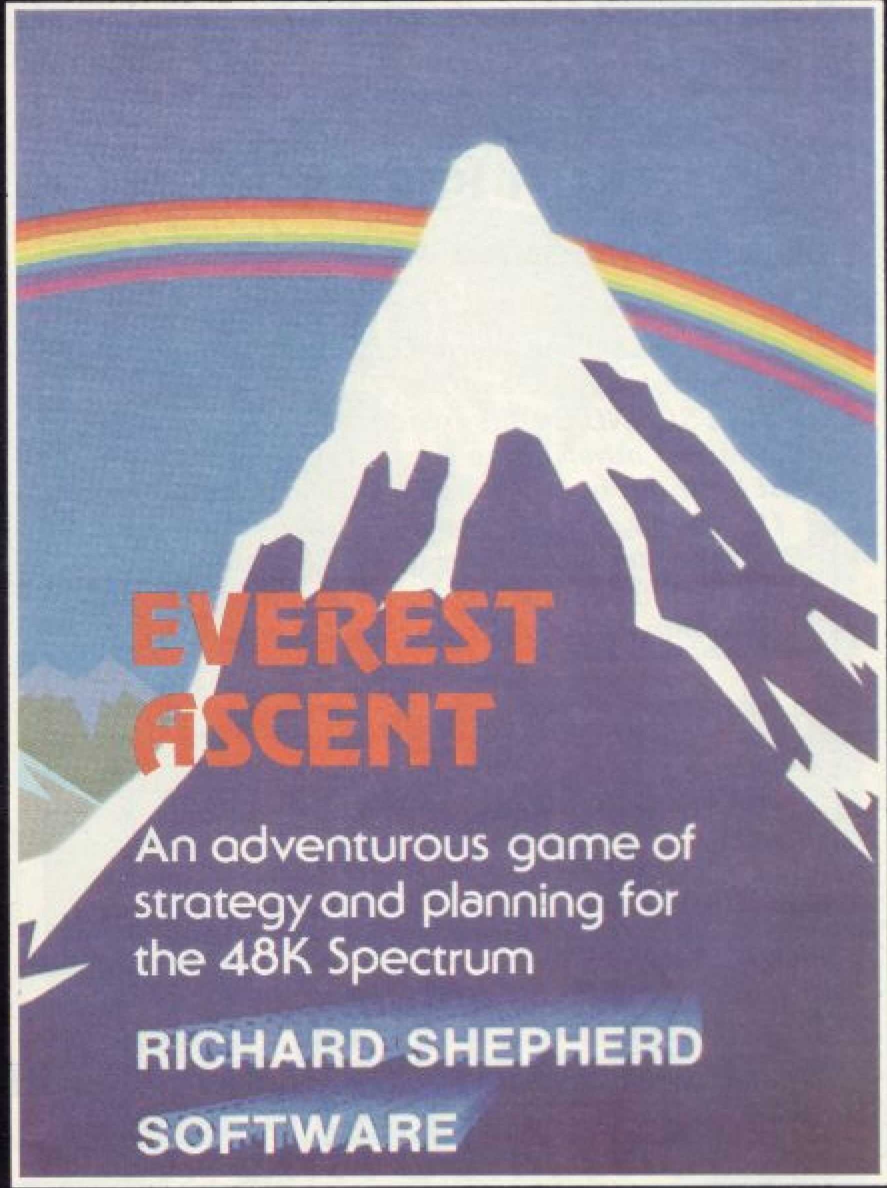
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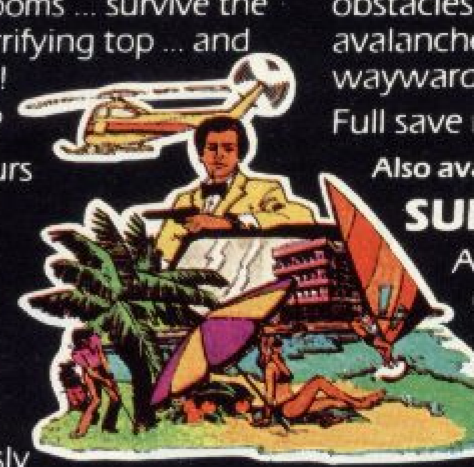
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Taking the strain out of calculating the wages

Starting with the ZX-80 Ronald Sims has always found serious uses for his machines. Claudia Cooke talks to him about how they help.

NO-ONE was more pleased than Vera Sims when her husband Ronald invested in his first computer, a ZX-80. For the first time in almost 20 years, her workload was reduced from a day-and-a-half each week to only four hours. Mrs Sims has the job of calculating and paying the weekly wages for the 35 employees of the family automation business.

"I used to do it all in my head, with the help of a ready reckoner and it took me a day and a half. Now my husband has written a program which does it all for me and it takes a few hours. It has been marvellous".

Her husband has since changed to a ZX-81 with a 64K Memopack and the program covers job costing for up to 10 jobs, tax deductions, a variety of individual allowances and more than 30 subtotals and totals.

Mrs Sims, 69, says: "It was a bit strange at first because I didn't know the first thing about computers but I soon got the hang of it and now I'm really pretty quick".

Husband Ronald, 70, interrupts to reveal that the early days were not that simple. "She just wouldn't believe it at first. When the computer produced the figures she used to take them down quickly and work it out herself to make sure. I must say her calculations were as quick as those of the computer.

> 'The computer just cannot make the kind of human errors everyone makes'

"Now she realises that the computer just cannot make the kind of human errors which every person is bound to make at some time or another".

Although the Sinclair is his first computer, Sims is no newcomer to the processes of logic involved. He had worked in the radio industry since 1929 and had become fascinated by 'wirelesses' even before he left school at the age of 17.

"At school we had a physics master who was very keen on the wireless, as it was known in those days. I was charged with his enthusiasm and by the time I left I was one of few people who knew how they worked."

His first job was with a firm selling do-it-yourself wireless kits. People would buy the kits on Friday, he says, and return on Monday to find what they were doing wrong. His job was to advise customers exactly how to assemble them.

"In the early 1930s I realised my technical education was not keeping pace with the changes so I got a job with Siemens in telephone exchange development work. The logic then was the same as the logic of computers today and I was given a good training".

When the second world war broke



out, the company had just begun work on the development of radar and Sims became chief of test gear.

"There was such urgency because of the war that we had to start manufacturing in quantity products which had not been made previously. Being responsible for testing, it was the first time I really became interested in automation and automatic testing."

After the war, Sims left to join Michael Sobell, first as technical assistant to the buyer and then as chief buyer. He stayed with the company for 12 years and says that without Sobell's commercial guidance he could never have started his own business.

Start it he did, 25 years ago, when he detected a gap in the industry for automation. Today his company, Lectromec Controls, is still flourishing in south London, run by his three grown-up sons and his ZX-81.

He is working on a cashflow program for the firm, although he is doubtful whether his Memopack can cope with a sufficient number of invoices.

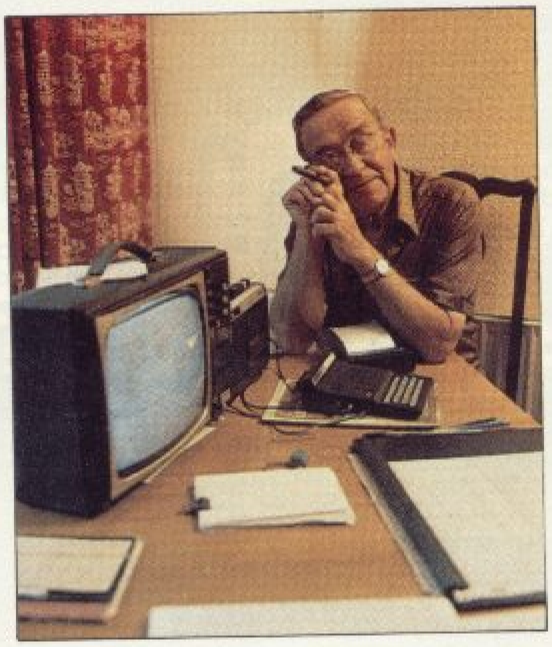
His wages program took many months to compile but the result has been worthwhile. Not only does it do the job much faster, it rules out the necessity for Mrs Sims to have her cash sheets checked by someone else before handing-out the pay.

"If you make a mistake you just look at the picture and know if it's right or wrong", says Mrs Sims. "The only thing is that you lose your brain, because you just look at the picture and copy it all down. I used to have to make so many calculations in my head but now I almost think you could become brainless within a few years."

Sims has one criticism of Sinclair, levelled at the printer. "I think it was very ambitious to produce this printer but I think it leaves a lot to be desired. It prints so badly; I think it's the thermal paper. If you leave it switched on all day, which we might need to do often, the whole thing gets warm and the print blurs".

On the whole, though, he sees his computer as a great boon and not only for work purposes. "We have four grandsons and you should have seen them with all those computer games at Christmas. We couldn't drag them away from the set. We all enjoyed it".

The eldest grandson, aged 12, has already had the ZX-80 bequeathed to him, together with the 16K memory.



He is at least as enthusiastic as his grandfather.

Now Sims is working on a conversation program to use with his grandsons at this year's Christmas gathering. It is a marvellous program so far, tailored individually to each of the four boys so that if one gives the computer his name, it is liable to answer back with the name of his brother.

A selection of 10 answers to each response from the boys appears at random, resulting in some highly-entertaining *non sequiturs,* as well as some startlingly accurate replies.

When asked how I was feeling by the computer, I replied "very hot", only to be told rather cheekily: "You look all right to me". When I agreed with the computer's suggestion, "I hear they call you Podge", it replied curtly. "Stop mucking me about".

Sims hopes to develop the program to around 10 or 15 minutes by Christmas and is gaining evident enjoyment from the work involved.

Aside from the computer, he and his wife are kept busy at their home in Ewell, Surrey. Mrs Sims is a regular bowls player, although sadly out of action during my visit due to a back injury. Her husband likes nothing better than to sit down for an hour or so and play the organ. He is from a musical family and as a child learned to play a variety of instruments, including the piano, violin, flute and piccolo, but his favourite remains the organ. "I particularly love playing classical music. I have always found it relaxing. To return home and get lost in the music for a time is a wonderful way of recovering from work".

The Sims also have a narrow boat, moored on the Thames, to which they retreat whenever possible during the summer months to enjoy the sun and the fresh air.

"Mostly we take it on the Thames these days, rather than the canals, but it is a wonderful way of relaxing. You don't have to arrange it all in advance; you just decide to go and that's it. It's a kind of freedom which is very valuable in business because, contrary to popular opinion, you cannot just take-off on holiday overseas whenever it suits you. You never know what will happen until the last moment".

Both are now semi-retired and the father figure wisely attempts to keep his nose out of the family business to a great extent, leaving his sons to run it the way they wish to do.

"I never pushed them into it, or expected too much of them. They all worked for other firms for a few years before joining me but I must admit it is pleasant that they all wanted to join. Now one is the managing director, one is sales director and the third is really installation manager".

One of his sons has also become a highly-proficient organist, playing in a dance band. His father pours generous praise on his talent.

Married for 43 years, the Sims are a contented couple, although not content to sit back and do nothing. Theirs is an active life, made more so by the advent in their home of the computer.

They certainly defy any theory that computers are for the young. It was Mrs Sims who, having read *Sinclair User,* became the first person to nominate someone for the title of User of the Month — her husband.

She nominated him not only for his wages program but also for the fact that he derives so much enjoyment and relaxation from compiling the programs. His enjoyment of making the programs, she says, is almost greater than his enjoyment of operating them in his computer and although she steers clear of programming, she has learned a new skill at an age when few women expect to do so.

'I think it was very ambitious to produce the printer but it leaves a lot to be desired; it prints so badly. If you leave it switched on all day the thing gets warm and the print blurs.'

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A NEW DIMENSION IN SPECTRUM SOFTWARE

Nick Goldman and Jerry Seabridge show how to merge programs without much difficulty

Two into one will now go on the ZX-81

ONE PROBLEM until now with the ZX-81 has been that when a program is loaded from tape any previous program in the computer is NEWed and lost. That means that two programs, each saved separately on tape, could not be merged into one program. That would clearly be useful for, say, writing subroutines which could be written and tested separately and then merged with a main program on a different tape. The merge feature has been included on the Spectrum and the routine we developed means that now two programs can quickly be combined into one, with few restrictions on the programs so merged, on the ZX-81.

The procedure used is outlined and explanations of the important steps are given. The basic theory is to reserve space in the 16K memory by putting RAMTOP, the address of the first byte, above the Basic system area, to a value below the normal 16K value of 32768, and then transfering the first program, byte by byte, into the reserved space.

The second program is then entered, along with a routine which will retrieve the first program, add it to the second program, and correct the values of line lengths — the third and fourth bytes in each program line, see page 171 of the ZX-81 manual — and so on, so that the program will not crash or behave abnormally. Here is the procedure:

First, the user's first program is entered from cassette tape. Restrictions on the program are that the line numbers must all be lower than 9899 but greater than the greatest line number of the user's second program, yet to be loaded. That is so that when the two programs are merged eventually, the line numbers will be in the correct order and the computer will not crash. To this program must then be added the final line:

XXXX REM END

where XXXX is the line number, which must be big enough to make it the last line of the first program but must still be less than 99. When the program is entered, the following direct commands must be entered, in the correct order:

LET X = PEEK 16396 + 256*PEEK 16397 — 1

LET Y = 49230 — X

PRINT Y

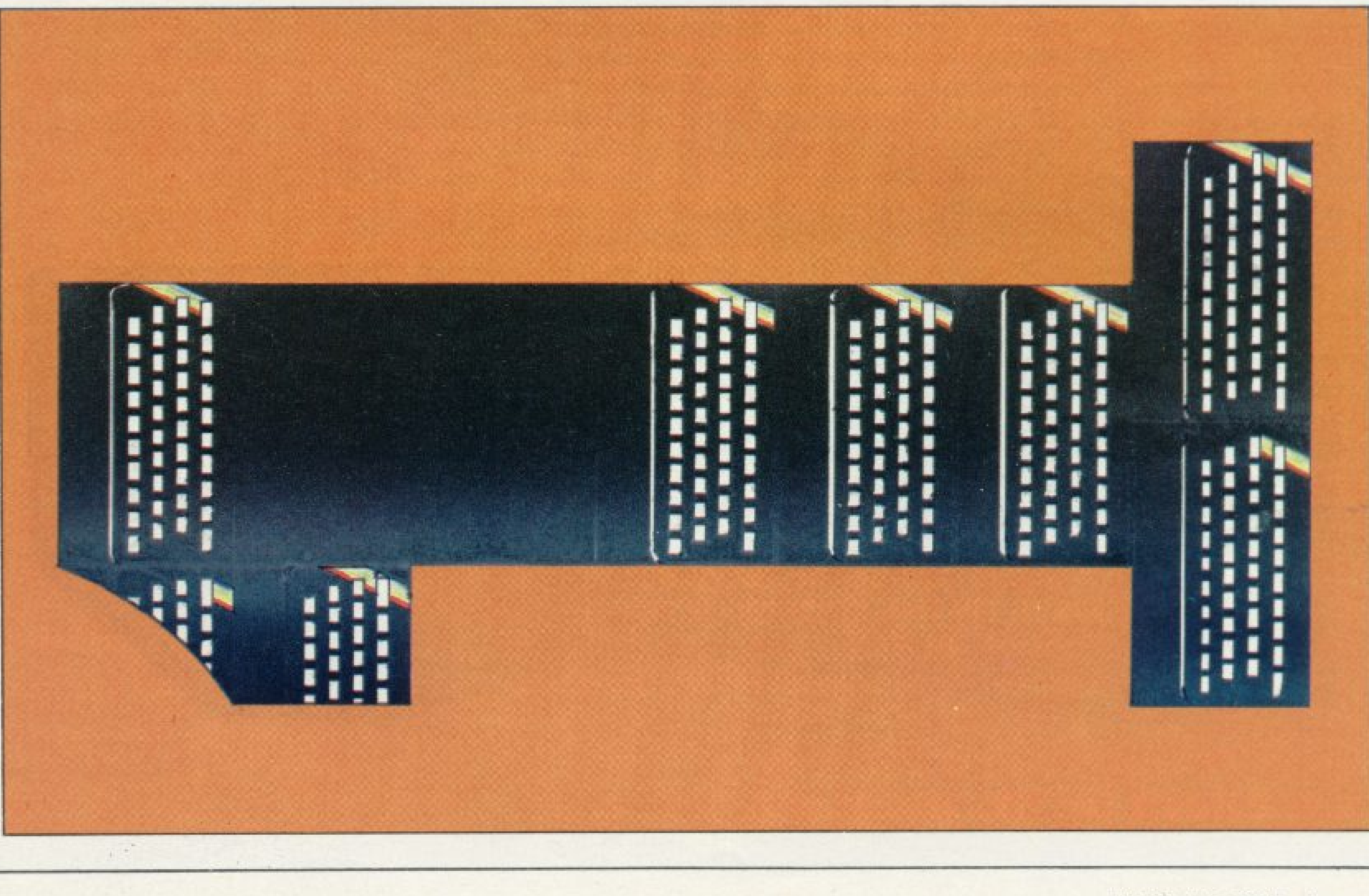
and the value of Y should be written or remembered. Then:

POKE 16388, Y — 256*INT(Y/256)

POKE 16389, INT(Y/256).

X, the value of D FILE — see chapter 27 of the ZX-81 manual — minus one, is the last byte of the program and is thus the last byte which must be transferred. Y is the location where the first byte of the program will be stored — 49230 was chosen as it leaves a little spare room before the end of the computer's 16K; and RAMTOP is poked to that value — the two POKE commands — so that when NEW is executed the transferred bytes will not be erased. That can be verified by typing:

PRINT PEEK 16388 + 256*PEEK



16389 which should give the value of Y which was written.

Next the routine given in listing one, lines 9900 to 9920, is added to the first program. Then type:
GOTO 9900 followed by:

NEW as soon as the computer has finished the loop starting in line 9900.

That routine copies the bytes of the first program into the memory, starting at the location given by the variable Y. NEW is executed to clear everything except those stored bytes. To verify that the first program is still stored above RAMTOP, type:
PRINT PEEK (your value of Y)*256 + PEEK (your value of Y + 1).

That should return with the first line number of your first program.

The next stage is to load your second program from tape. The program should have all of its line numbers greater than 13 but smaller than the smallest line number in the first program, so that, again, the eventual lines when merged will be in the correct order.

Once that is done the routine given in listing two — lines 1 to 13 only — should be typed-in, and then the following direct commands:
LET Y = (your previous value of Y)
LET K = PEEK 16396 + 256*PEEK 16397
and after those, REM statements must be typed-in, as lines 9900 and 9901 in listing two. Each REM statement should include 100 Xs and there should be 10 such REM statements for each 1K of the first program which has already been copied above RAMTOP.

After one REM statement has been typed-in, the other can be duplicated quickly by using the EDIT facility and adding 1 to the line number each time the line is copied. In that manner the correct number of REM statements can be produced quickly.

Listing 1.

```
9900 FOR F=16509 TO X
9910 POKE Y-16509+F,PEEK F
9920 NEXT F
```

As soon as the REM lines have been typed-in, the command GOTO 1 should be entered. The routine — lines 1 to 13 — will then transfer the first program back from above RAMTOP back to the main program, and when the report code 9/13 — STOP executed in line 13 — is seen, the final. The merged program can be tidied by deleting lines 1 to 13 and any left-over REM lines after line 9900 may also be removed.

This is how the final 13-line routine works:

The first two lines POKE RAMTOP to its usual (16K) value of 32768. That is so that as the routine progresses, the space where the first lines were stored can be over-written once those lines have been re-transferred, and that enables longer programs to be merged.

> 'Until you are confident that you have the procedure correct we suggest that you take the extra time to run the routines in slow mode and keep an eye on the computer'

Lines 3 to 4 check for the location of the REM command in the line:
XXXX REM END
at the end of the first program, that being the marker used to indicate the end of the first program, and the loop passes to line 5 with the variable F being the location of this REM command.

The variable K which was defined previously by direct command is the location of the first byte in the first REM line — line 9900 — and is the location into which the first byte of the first program is POKEd. The REM statements are used to reserve space below the Display File — we spent some time trying to POKE the system variable D FILE but with no success — and the first program is simply POKE into the locations occupied by the REM lines. Thus lines 5 to 8 POKE the first program into the space reserved by the REM lines, except for the CHR$ 118 which indicates the last character in the line:
XXXX REM END
Lines 7 and 9 are to clear the space which was occupied by the first program.

Finally, lines 10 and 11 count the extra Xs left over from the last REM line POKEd into and line 12 POKEs the new length of the last line into the appropriate location. That means that the line
XXXX REM END
will finally become:
XXXX REM END (+ left-over Xs from the REM line)
e.g., XXXX REM END XXXXXXXXXXXXX
and the appearance of this is an indication that the merging is successful. Of course, if the final REM line had exactly the correct number of Xs, the line will remain
XXXX REM END

Using this routine we believe that any two Basic programs can be merged into one. Of course, that does not extend the limit of 16K imposed by having only a 16K RAM pack and it should be noted that any variables stored will be lost as the procedure is followed.

A large number of direct commands have been used where they could have been included in the two routines we have given — listing one and two — since if the procedure is to be worthwhile it should be as short as possible.

For long programs it is obviously superior to run the two routines in FAST mode but that is not very informative if for any reason the computer should crash. Therefore until you are confident that you have the procedure correct, we suggest that you take the extra time to run the routines in SLOW mode and keep an eye on the computer, even if that takes a long time.

Listing 2.

```
1 POKE 16388,0
2 POKE 16389,128
3 FOR F=Y TO 99999
4 IF PEEK F<>234 OR PEEK (F+1
)<>42 OR PEEK (F+2)<>51 OR
PEEK
(F+3)<>41 OR PEEK
(F+4)<>118 THEN
NEXT F
5 FOR G=Y TO F+3
6 POKE G+K-Y,PEEK G
7 POKE G,0
8 NEXT G
9 POKE G,0
10 FOR G=F+K-Y+4 TO 99999
11 IF PEEK G<>118 THEN NEXT
G
12 POKE F+K-Y-2, PEEK
(F+K-Y-2)
-F+G-K+Y-4
13 STOP
9900 REM XXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXX
X
9901 REM (100 Xs)
```

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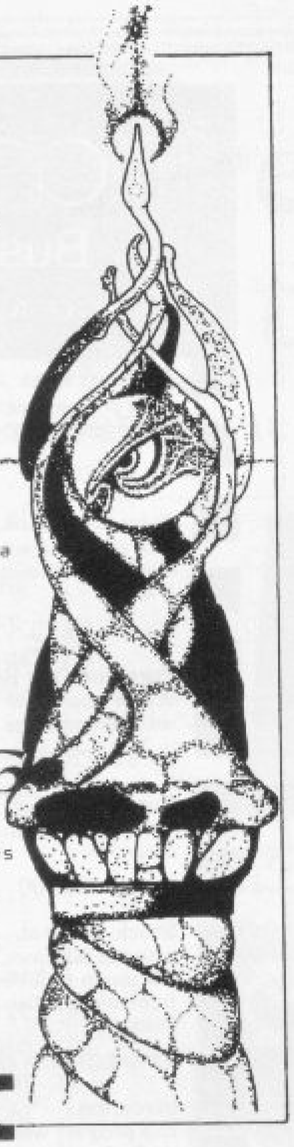
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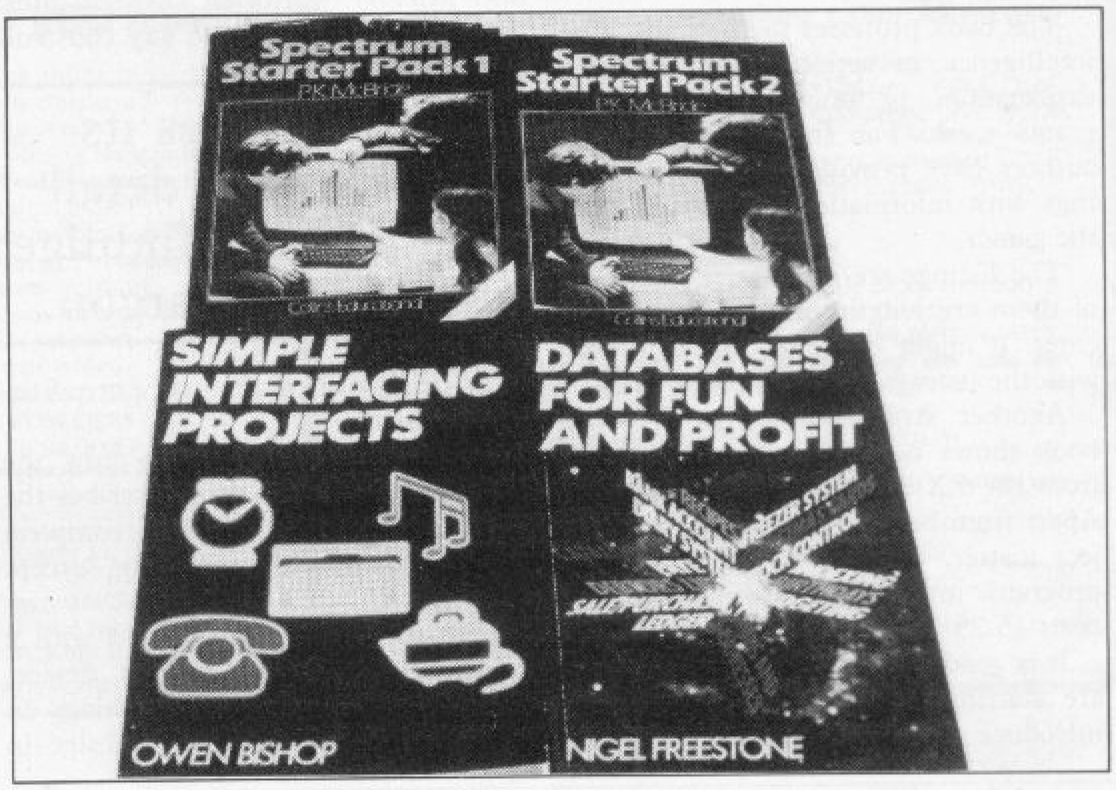
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Poor presentation handicaps teaching aids

John Gilbert reviews the latest releases.



THE EDUCATIONAL sector of the book market is expanding but the standard is not becoming noticeably higher. Although the psychology of teaching by computer seems to be developing in the proper direction, the standard of presentation in many cases is not good enough. The explanation is that the books on the market are either too difficult or too easy for the beginner to understand.

The *Spectrum Starter Packs,* numbers one and two, are for the 48K Spectrum. They suffer from being too easy for the age range at which they seem to have been aimed. The packs do not take into account that most children looking at them are growing up in an age of electronics. They do no more than illustrate points in the Spectrum manual and show how the various commands work on the computer.

Both starter packs contain program cassettes which explain how the computer works and provide examples of the Spectrum Basic commands. Most of the information on the cassettes is dealt with in the books accompanying the packs, so the inclusion of such cassettes is superfluous.

The books could be used in primary schools, although they would be of more value as a talking-point for teachers than an aid which is given to children who are then left to learn programming virtually on their own.

The intentions behind the starter packs seem good but a little more work could have gone into them to improve the presentation. *Spectrum Starter Packs,* one and two, cost £9.95.

Books on so-called good programming techniques are now forming an important sector of the market. Although most authors fail to inform their readers that there is no best way of programming, the standard of the books is good.

Databases for Fun and Profit, by Nigel Freestone, is one of the good programming books. The author aims to give the reader an understanding of data structures which are used in programming. The book is not machine-specific and should be easily understood by most owners of the ZX-81 and Spectrum.

It starts by introducing the binary and hexidecimal number systems which are associated with computers, particularly with storage and machine code. It then explains how arrays can be used to create a variety of data structures, such as lists, trees and stacks.

When those structures have been explained the author shows how they are used in several types of programs. He shows what is needed to write diary and bank account programs and name and address systems. He also shows how to incorporate arithmetical formulae, such as income tax calculations, into a program to provide some way of processing the data once it is entered.

Databases for Fun and Profit contains much valuable information for anyone wanting to put Sinclair machines to good use. It is published by Granada Publishing and costs £5.95.

Turning from software projects we move to hardware with *Simple Interfacing Projects,* by Owen Bishop, also published by Granada.

Like the book on databases it is not machine-specific and that makes it different from all the rest. The projects include a real-time clock, a music generator and a ROM board. There are 12 projects which can be built and they are laid out in an easy-to-understand manner. A brief explanation is given of the project and how it works, then the construction details are discussed. As a result the book would be of interest to anyone who has a computer and a basic grounding in electronics. Some experience of programming would also be useful but not essential. *Simple Interfacing Projects* costs £6.95.

Another book which will be of interest to ZX-81 owners is *The Ins and Outs of the Timex TS-1000 and ZX-81,* by Don Thomasson. The book looks as if it was written for a readership in the States but it has some relevance in Britain. It explains the hardware of the ZX-81 and includes a complete circuit diagram of the machine.

The author explains how the CPU chip works and gives a detailed account of the pins which feed it with input and output data. A practical knowledge of electronics is necessary for you to follow the discussions in the book and a knowledge of machine code would also be helpful. It is published by Melbourne House and costs £5.95.

A new work from Interface is *The Turing Critereon — Machine Intelligent*

continued on page 96

continued from page 95

Programs for the 16K ZX-81. The introduction defines computer intelligence as communicating along a wire with something which you are not sure is human or machine.

The problem with the book is that you cannot tell whether it has been written by a human author or a machine, because it is full of listings and not much else.

The book professes to show machine intelligence in action, complete with explanations of how intelligent programs work. Far from doing so the authors have provided a group of listings with information on how to play the games.

The listings are impressive but some of them are lengthy and take hours to enter. It might be better to buy a tape with the listings recorded on it.

Another strange thing is that the book shows how to convert programs from the ZX-80 into ZX-81 programs. Apart from being irrelevant to the subject matter, the idea of typing ZX-80 programs into a ZX-81 seems futile. It costs £5.25.

It is good to see that most publishers are starting to reduce prices as they introduce new titles. All the titles in this month's review cost less than £7. Last year books about Sinclair computers cost anything from £5 to £15.

Many publishers are having to lower prices because of the competition from companies which have just entered the market. As a result the standard should continue to rise and prices should fall.

The first book to deal with the insides of the Spectrum, *Spectrum Hardware Manual* by Adrian Dickens, must be a welcome addition to any construc-

> 'It describes its workings in detail and does not indulge in technical jargon.'

tor or student of computers, writes **Stephen Adams.**

It provides an insight on how the computer works and then describes the Spectrum in detail, including complete circuit diagrams of everything, except the ULA.

The user has to be satisfied with a pin-by-pin description of that device. The author describes its workings in simple detail and does not indulge in technical jargon. The circuit principles are explained but not component by component, except where the author is sure of his ground, i.e., the power supply, CPU and RAM chips.

The video section is a little misleading as it refers to B-Y as BLUE-YELLOW, where in real life the Y stands for luminance — the whiteness of the picture. It gives the adjustments necessary to deal with some problems associated with the video.

One-third of the book is circuit diagrams and descriptions of circuits the user can add to the back of the Spectrum. The author seems a little nervous about suggesting that the user make improvements inside the Spectrum. A port made from a PIO, add-on joysticks, plus an exterior keyboard are also described. One suggestion for model one users only is to allow for 127 extra ports by improving on the decoding for the I/0 map.

The differences between the models one and two are pointed-out frequently, with photographs to show the components on the circuit board. A "dead cockroach" IC and the transistor across the model two Z-80A CPU are described, along with why they were necessary.

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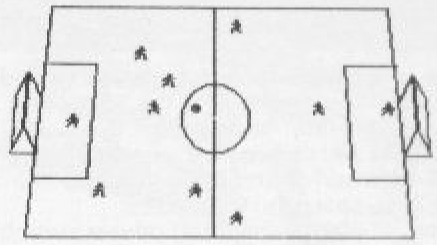
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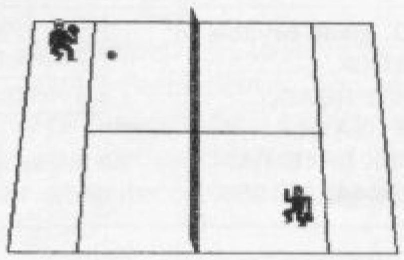


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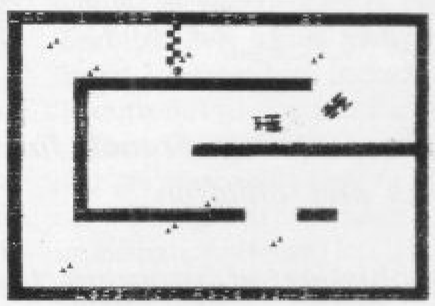


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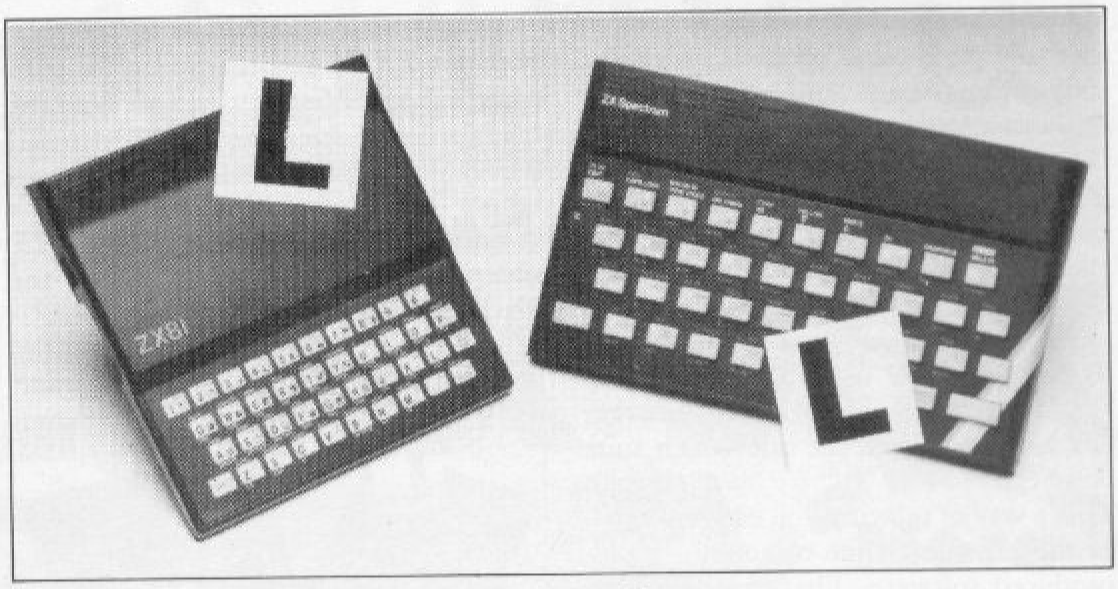
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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.
Bug — an error in a program.
EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.
Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.
Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.
Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.
Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.
Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.
Port — a link to the outside world which can be used by programs and the computer.
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.
RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.
ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.
Software — programs which control the operation of the computer.
Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 102

continued from page 101

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is that important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

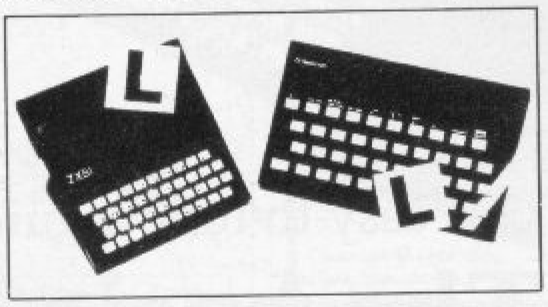
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.



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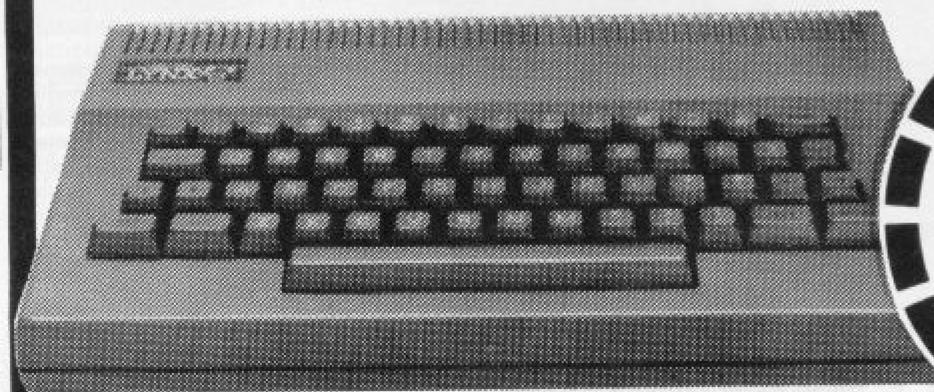
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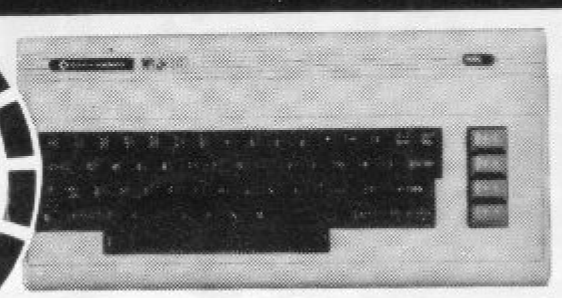
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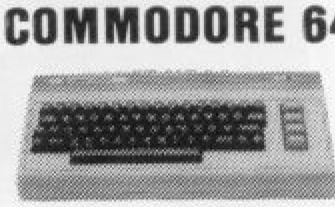


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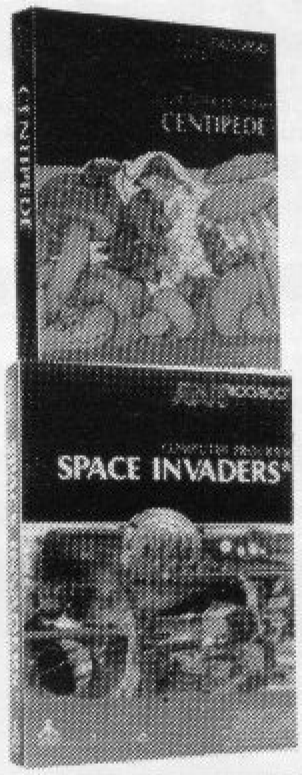
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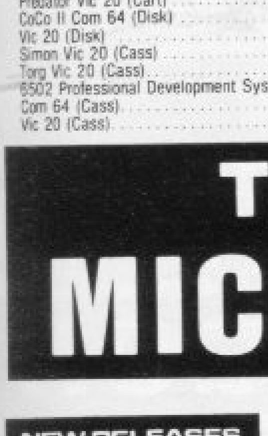
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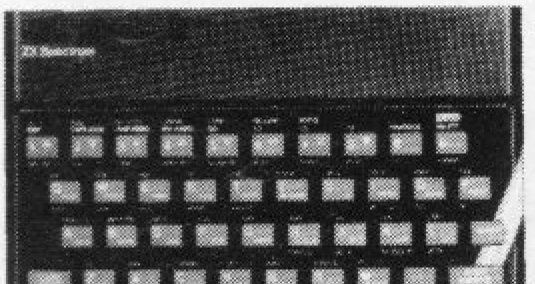
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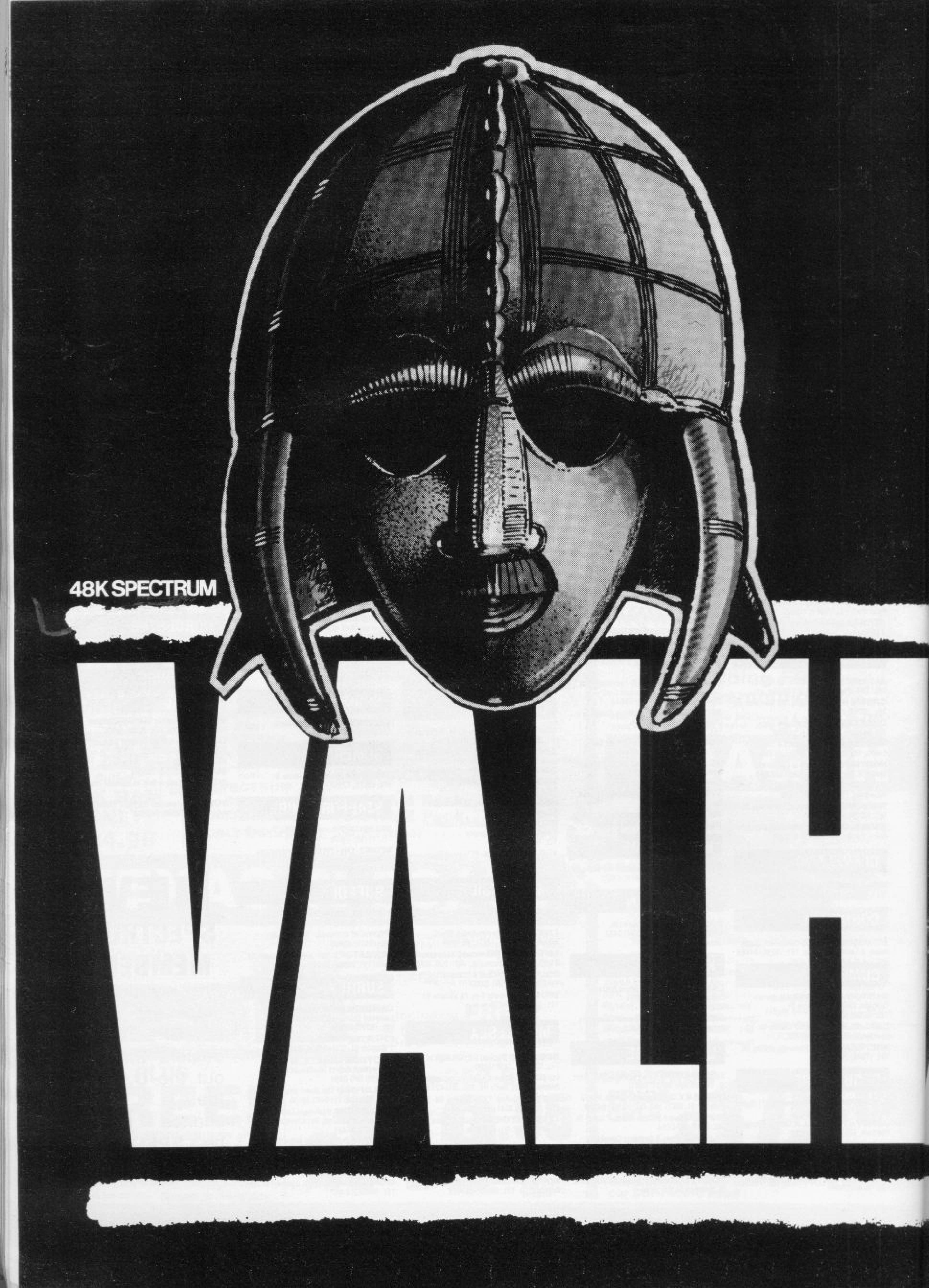
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48K SPECTRUM
VALH

"VALHALLA is an animated graphics adventure whose undisguised intention is to steal the title of "best micro adventure game bar none" from THE HOBBIT.

The 48K program uses a new operating system MOViSOFT and boasts a number of HOBBIT-like features. There are 20 significant characters, each with their own aims and objectives.

You are a minor God set the task of recovering Odin's Golden Helmet. To complete this you will also have to master three lesser tasks, one of which is to rescue IDUN, a maiden responsible for the Golden Apples which keep the Gods youthful.

The games' designer, LEGEND, claims that the program involves a sophisticated degree of interaction. For example, should an enemy overhear you telling a friend some important information, he will try to ruin your plans.

LEGEND stresses that the personality of each of the characters is genuinely independent "as opposed to pseudo independent behaviour like Thorin sitting down and singing about gold or Gandalf walking off with your door for no reason".

The moving graphics are reportedly of cartoon quality, with both background and foreground movement illustrating the events of the plot.

Pretty impressive claims. HOBBIT fans will no doubt feel both intrigued and sceptical.. Watch this space."

...Graham Taylor,
Software Editor,
POPULAR COMPUTING WEEKLY —26th MAY'83

MOVi SOFT ©

• UK Release August 15th.

LEGEND

ALLA

What is the difference between a bit and a byte?

Andrew Hewson considers the basics of machine code

HAVING RECEIVED a number of letters asking about the fundamental ideas of machine code programming, I have devoted most of the column to the topic. John Stevens of Hammersmith, London writes:

I am trying to learn how to write machine code programs but I am finding it difficult to understand the meaning of some of the words which are used. Can you explain as fully as possible what is the difference between a bit and a byte, and between a register and a variable?

A bit is the fundamental building block of computer memory and can exist in only one of two states. The two states can be thought of as representing ON or OFF; TRUE or FALSE; YES or NO; UP or DOWN; MALE or FEMALE or any other pair of logically opposite conditions. The mechanism by which a computer memory works is not really important to us but in the Sinclair computers the state of a bit is memorised by setting a microscopic solid state switch either ON or OFF as appropriate.

The usual notation is to think of one state as the ZERO state and the other as the ONE state. A bit is considered to be set when it is in the state representing ONE and to be re-set otherwise. That notation allows us to speak of a given pattern of bits in terms of its binary equivalent and by converting the binary number to a decimal; each bit pattern can be given an exceptional positive integer decimal number.

For example, consider eight bits of which the right-most four are set and the left-most four are re-set as illustrated in table one. The binary pattern of the eight bits can be converted to a decimal if it is remembered that, in a binary number, the right-most column is the units column; the next column to the left is the twos column; the next to the left again is the fours column and so on, doubling at each move to the left. The decimal equivalent of 00001111 is therefore:

$$0*128+0*64+0*32+0*16+1*8+1*4+1*2+1*1=15$$



• *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

Obviously it is inconvenient to refer to bits as the right-most or the third from the right and so the convention is adopted of numbering the bits from the right, starting at zero as shown in table one. When that convention is used the number of each bit is also the power to which 2 must be raised to give the value of the column. That is:

$$2^{\text{bit number}} = \text{column value}$$

Bit 3, for example, is in the eights column because $2^3=8$.

I chose to consider a group of eight bits together because the Z-80A microprocessor at the heart of the Sinclair computers is designed to operate on eight bits at a time. The term operates covers all the types of task which the Z-80A can perform directly such as addition, subtraction, rotation, logical AND, and the like. Thus although a bit is the fundamental unit of computer memory, bits are usually manipulated together in groups of eight, so a group of eight bits is called a byte — pronounced bite.

There are 256 ways of arranging the contents of a group of eight bits. The first is 00000000, the second is 00000001, the third is 00000010. Thus each of the bytes in RAM can be used to hold a single positive whole number lying between 0 and 255 inclusive by setting or re-setting the eight bits in the byte according to the binary equivalent of the number.

The Z-80A does not alter the contents of memory directly when it is executing a program; rather it copies the contents of a location in memory into one of several special locations in the microprocessor called a register and then operates on the contents of the register. The Z-80A is a powerful microprocessor because it has many registers and so it can hold several numbers at once, thereby reducing the need to make time-consuming transfers between the processor and memory.

Most of the registers have one or more special features. The most important one is the 'a' register or accumulator, so-called because the results of most

Switch setting	**Off**	**Off**	**Off**	**Off**	**On**	**On**	**On**	**On**
State	**Re-set**	**Re-set**	**Re-set**	**Re-set**	**Set**	**Set**	**Set**	**Set**
Binary pattern	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**
Bit number	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**

Table 1. Three ways of representing a group of eight bits of which the four left-most are re-set and the four right-most are set. The bit number is shown on the bottom line.

```
10    FOR I=23296 TO 23325
20    INPUT Z$
30    IF Z$="S" THEN STOP
40    PRINT Z$;"    ";
50    LET Z$(1)=CHR$ (CODE Z$(1)—7*(CODE Z$(1)  57))
60    LET Z$(2)=CHR$ (CODE Z$(2)—7*(CODE Z$(2)  57))
70    POKE I,16*CODE Z$(1)+CODE Z$(2)—816
80    NEXT I
```

Table 3. A Spectrum program to load 30 two-character hexadecimal codes into the printer buffer.

arithmetic or logical instructions are accumulated in the 'a' register. Some instructions use a second register as a second source of data together with the 'a' register.

For example the instruction:

add a,b

means add the contents of the 'a' register to the contents of the 'b' register and leave the result in 'a'.

Thus a register is a dedicated location in the microprocessor which has specific attributes and functions. A variable is a location or group of locations in RAM which are used by a particular program. If the program is written in Basic or another high-level language, the variable is given a name and all references to the variable are made using the name.

The next question, from Alan Bermingham of London, follows from the previous one. He asks:

What do the following programs do—an assembler, a disassembler, an interpreter, a compiler?

A machine code routine consists of a sequence of instructions which the Z-80A understands directly with no need for prior interpretation. The simpler instructions are held in one byte of memory but the more complicated instructions can occupy as many as four bytes.

Generally, the instructions are executed in the order in which they are encountered, although there are exceptions. The Z-80A keeps a note of from where the next instruction is to come by means of a special register pair called the program counter. Thus if the location pointed to by the program counter contains the number 128 in decimal — 80 in hexadecimal — the Z-80A will add the contents of the 'a' register to the contents of the 'b' register and leave the result in the acumulator, because 128 is the decimal machine code instruction for add a,b

The decimal or hexadecimal codes for all the 600 or so instructions in the Z-80A instruction set are difficult to remember and so for that and other reasons machine code programs are almost always written using an assembler program. An assembler converts instructions like add a,b to the correct code. It also allows the programmer to name variables, add comments and give labels to various points in the program and to call subroutines using the labels. A good assembler will have other facilities as well, all aimed at making the programmer's job as straightforward as possible.

A disassembler performs the opposite function to an assembler; it converts a sequence of numbers into a sequence of mnemonics which are easier to understand than the original code. A list of the more important mnemonics is given in the Sinclair manuals in Appendix A. A disassembler is of use when analysing code written by somebody else to discover how it works.

The output from an assembler is a program which the microprocessor can understand directly because it consists of machine code instructions. In contrast, a program written using an interpreter, such as Sinclair Basic, is held in RAM in more or less the form in which it was entered by the programmer.

Interpreters are high-level languages which bear little or no relationship to the instruction set of the processor on which they are run. Every time the program is executed, however, each line must be analysed by the processor before the required action can be taken. The principal disadvantage of the system is that the programs can be slow to execute, because the processor spends most of its time determining what each program line means.

'A disassembler is of use when analysing code'

A compiler circumvents the problem by analysing each program line once only and then storing a sequence of machine code instructions which are equivalent to the original program. Thus the speed of a machine code program is obtained without losing the convenience of a high-level language. The machine code produced by a compiler can be somewhat tortuous and inflexible and so when efficiency is essential an assembler is used instead.

Robert King of London asks: **I have a program which works well on my friend's Spectrum but always crashes on mine. I suspect a fault in the RAM. Have you a program which checks each RAM location in turn?**

Checking RAM involves setting every bit of every byte, checking that it remains set, and then re-setting every bit and checking that it then remains re-set. Setting every bit in a byte is equivalent to POKEing 255 into that byte. Similarly, re-setting every bit is equivalent to POKEing-in 0.

Obviously it is not possible to POKE numbers into every memory location while the machine is running, because the computer will crash, but a partial check can be made by testing every location in the spare area of memory.

The program in table two runs such a check. It can be loaded using an assembler or using the simple hexadecimal loader listed in table three. The program checks every location up to the bottom of the stack and returns the address at which it stops — about 32575 in the 16K machines and 65343 in the 48K machine when they are working correctly.

Finally, I must apologise for an error in the Kaleidoscope program which appeared in the June issue. Line 100 should read:

100 POKE S+32−31*I+32*J,K

My thanks to all those who pointed-out the error.

Hex code	Assembler code	Comment
2A 65 5C	LD HL, (23653)	Set HL to address of spare space
44	LD B,H	Copy HL
4D	LD C,L	to BC
3E OO	LD A,O	Set A to O
77	LD (HL),A	Copy A to memory
7E	LD A, (HL)	Copy memory back to A
FE OO	CP O	Compare result
CO	RET NZ	Return if error
3E FF	LD A,255	Set A to 255
77	LD (HL),A	Copy A to memory
7E	LD A,(HL)	Copy memory back to A
FE FF	CP 255	Compare result
CO	RET NZ	Return if error
A7	AND A	Clear carry flag
23	INC HL	Increment HL
ED 72	SBC HL,SP	Subtract stack pointer from HL
C8	RET Z	Return if finished
A7	AND A	Clear carry flag
ED 7A	ADC HL,SP	Add stack pointer to HL
O3	INC BC	Increment BC
18 E7	JR −25	Repeat for next memory location

Table 2. A Spectrum machine code program to test each memory location between the beginning of the spare space—marked by the STKEND system variable—and the bottom of the stack.



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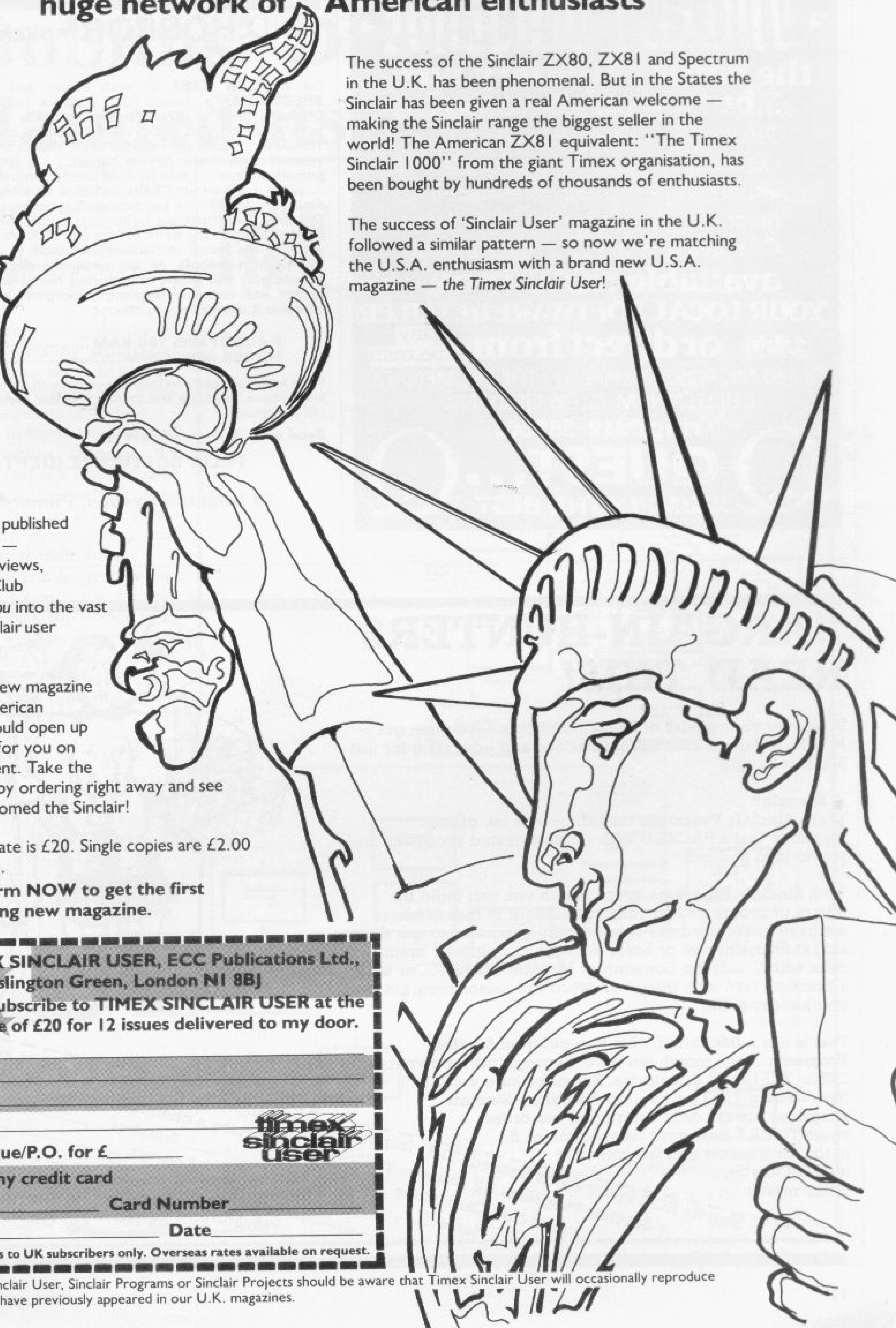
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Following his last article about The Hobbit, Quentin Heath has received many pleas for help. He makes his last visit to Middle Earth.

Goblins' Dungeon has claimed its last victim

THE HOBBIT has proved to be one of the most popular adventure games for the 48K Spectrum. It has been elevated to cult status by many readers of Mind Games who continually find themselves stuck in the Goblins' Dungeon or facing the Dragon without an arrow.

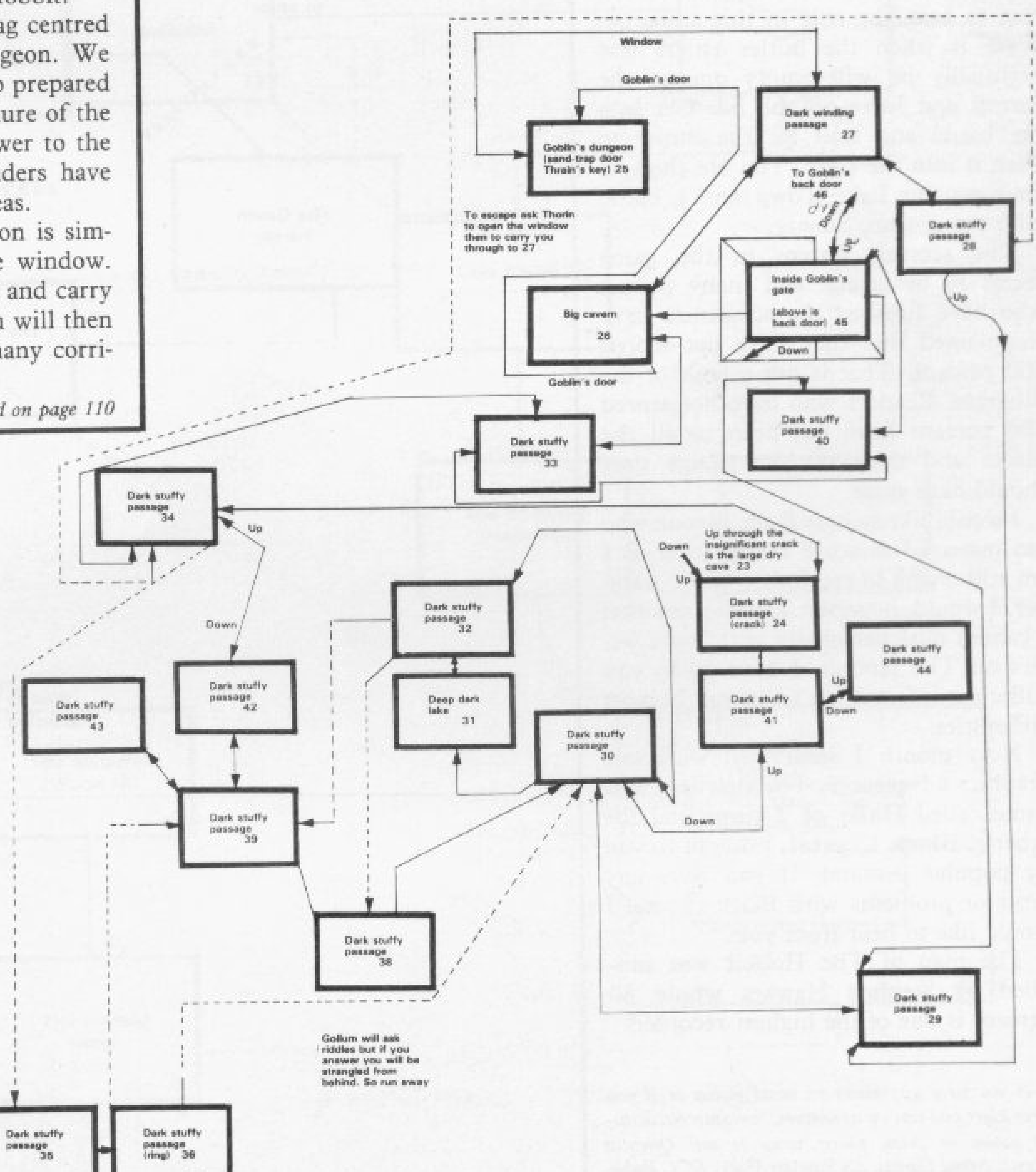
This month I am closing the file on The Hobbit by revealing some hints and tips which have never been published. I warn you to read on only if you want to know the secrets of Hobbit.

The questions in my postbag centred mainly on the Goblins' Dungeon. We have reproduced part of a map prepared by a reader to show the structure of the dungeon to give you the answer to the problem, to which many readers have written to contribute their ideas.

The way out of the dungeon is simple. Ask Thorin to open the window. Then ask him to pick you up and carry you through the window. You will then find yourself in one of the many corridors of the Goblins' domain.

continued on page 110

THE GOBLINS LAIR



continued from page 117

Some people have not tried to cross the river and doubled back to the forest gate. There is a boat hidden on the other side of the river and all you have to do is to throw the rope across, pull the boat through the water and climb into it.

You will then find yourself on the east bank and about to face those deadly spiders looking for a quick snack.

When you arrive at the first spiders' web you must break it with your hand. If you try to pierce it with your sword you will find yourself in trouble. Once you have broken the web you will be in the domain of the spiders. You can go east or north from there but if you want to survive you should take the latter option. If you go east you will finish in the deep bog.

The Elven King's Cellar is also a cause of difficulties. Some people find it difficult to get into the barrels to float in the river beneath the trap-door. It is best to have the ring in this situation. Wear it when the butler enters and eventually he will empty one of the barrels and leave off the lid. Get into the barrel and wait for the butler to push it into the river. You are then on your way to Lake Town and a battle with the dragon, Smaug.

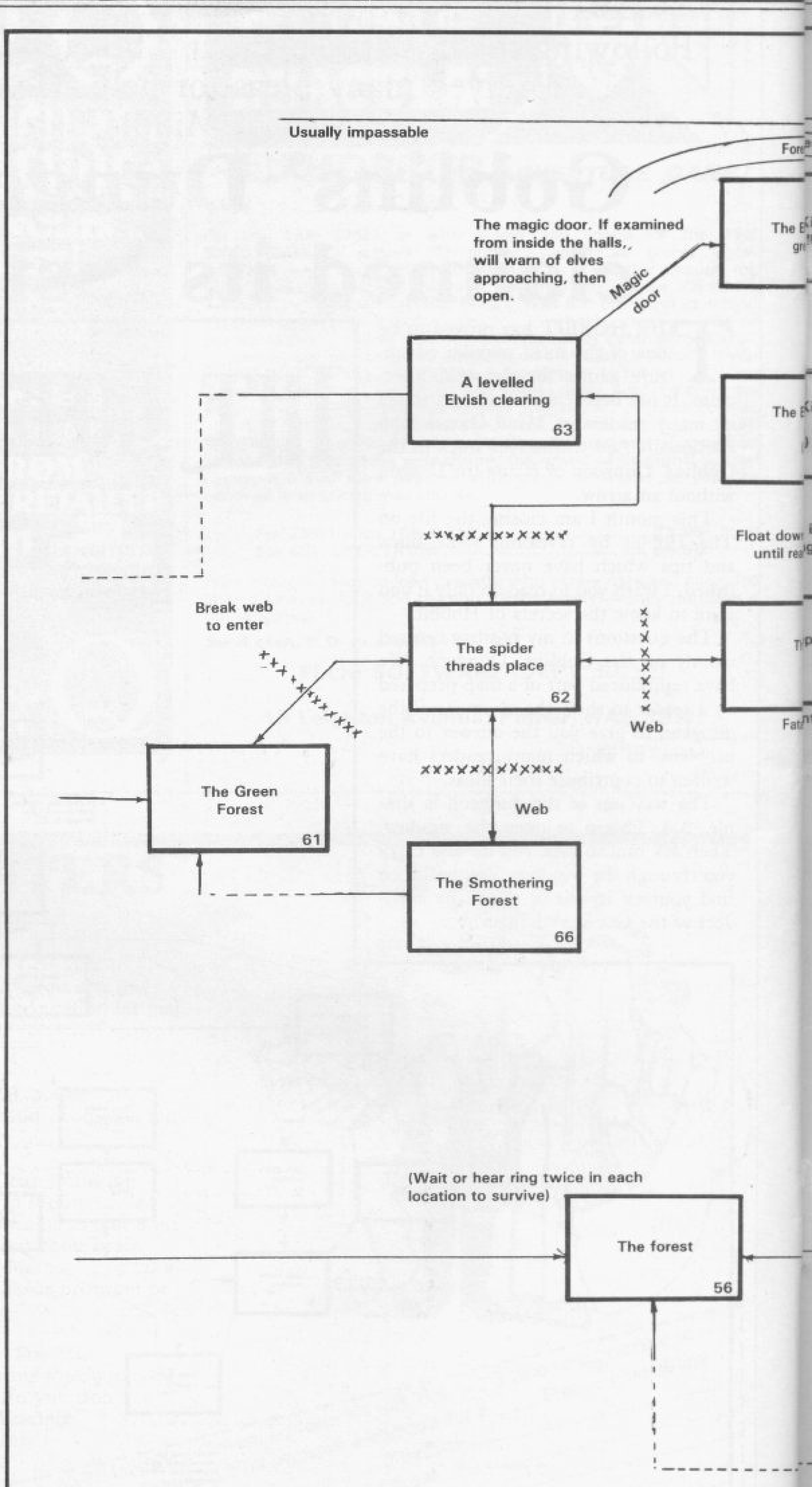
The scoring system in the game seems to be erratic and many people who have finished the adventure have complained that they have not scored 100 percent. That is not a fault of the program. Readers who have not scored 100 percent have not been to all the places and done all the things they should have done.

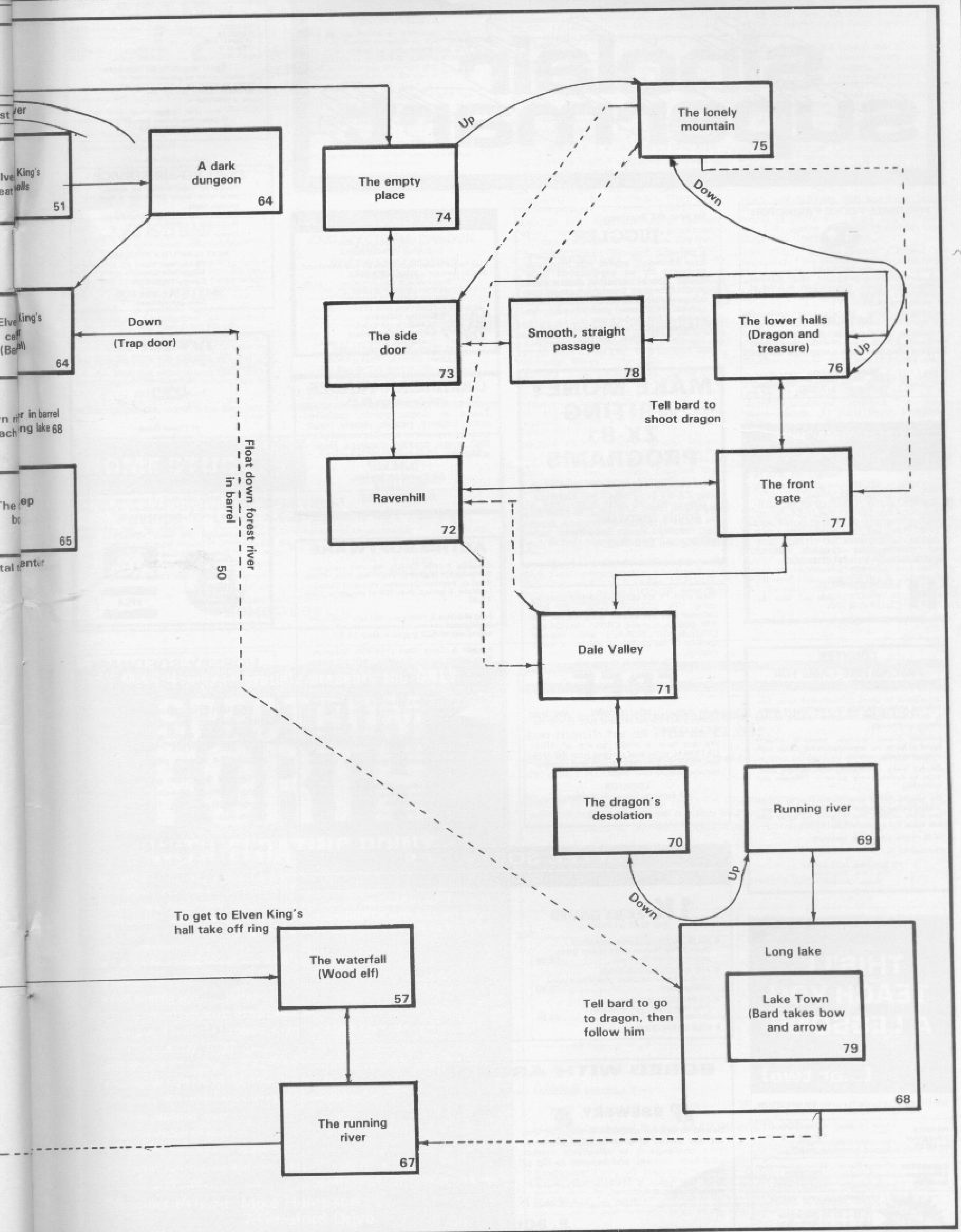
I would like to hear from anyone who has managed to score 100 percent as I am still trying to reach that magic number. I would, however, like to stress that I cannot deal personally with more letters on The Hobbit. I have given you sufficient information to get out of most difficulties.

Next month I shall deal with two graphics adventures. The first is a new game called **Halls of Things** and the other is **Black Crystal,** brought to you by popular demand. If you have any hints or problems with Black Crystal I would like to hear from you.

The map of The Hobbit was supplied by Stephen Hawkes whose 80 percent is one of the highest recorded.

● *If you have any views on mind games or if you have hints and tips on adventure, computer-moderated games or chess, please write to me: Quentin Heath, Mind Games, c/o* Sinclair User, *ECC Publications, 30-31 Islington Green, London N1 8BJ.*




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Author: **C. K. Tame**
ZX81 with 16K RAM

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Author: **M. Sudworth**
ZX81 with 16K RAM

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Author: **P. Crane**
ZX81 with 16K RAM

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